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FOREST PEST MANAGEMENT

United States
Department of
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Forest
Service

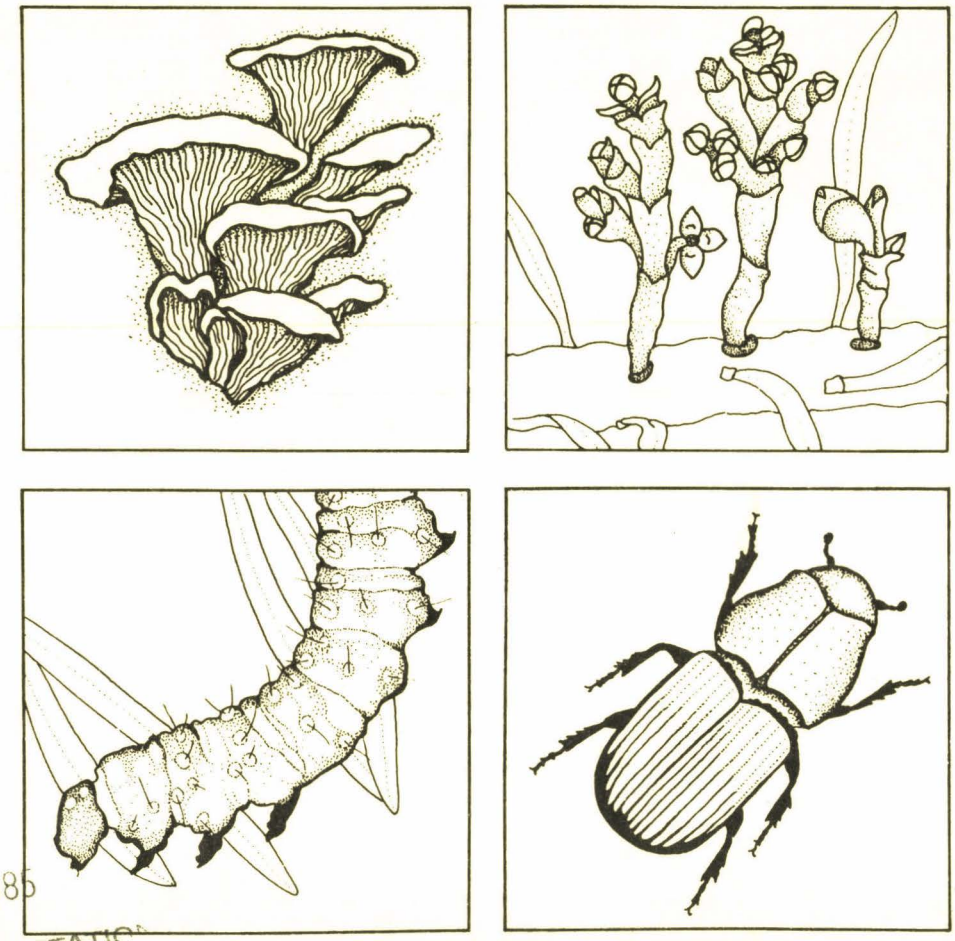
**Northern
Region**

**State &
Private
Forestry**

STATUS OF
MOUNTAIN PINE BEETLE INFESTATIONS
NORTHERN REGION
1984

Report No. 85-25

October 1985



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STATUS OF MOUNTAIN PINE BEETLE INFESTATIONS NORTHERN REGION, 1984

by

M. D. McGregor, K. E. Gibson, S. Tunnock, and L. E. Stipe, Entomologists
H. E. Meyer and R. D. Oakes, Biological Technicians

USDA Forest Service
Northern Region
Cooperative Forestry & Pest Management
Missoula, Montana

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SUMMARY

Mountain pine beetle infestations surged upward on the Bitterroot, Custer, Deerlodge, Flathead, Helena, and Kootenai National Forests, and on the Blackfeet and Northern Cheyenne Indian Reservations in Montana, and on the Nezperce National Forest and Bureau of Land Management lands in Idaho in 1984. Infestations remained static from 1983 to 1984 on the Lolo National Forest and declined on the Beaverhead and Gallatin National Forests, in Glacier and Yellowstone National Parks, on the Crow, Flathead, Fort Belknap, and Rocky Boy's Indian Reservations, and on Bureau of Land Management lands in Montana.

A continued decline is predicted due to host depletion in most areas for infestations on the Beaverhead and western portion of the Gallatin National Forests, in Glacier and Yellowstone National Parks, and on the Blackfeet Indian Reservation in 1985.

In 1985 infestations are predicted to increase in lodgepole and/or ponderosa pine types on the Bitterroot, Custer, Deerlodge, Flathead, Helena, Kootenai, Lewis & Clark, and Lolo National Forests, on the Crow, Flathead, Fort Belknap, Northern Cheyenne, and Rocky Boy's Indian Reservations in Montana; and on the Nezperce National Forest, Bureau of Land Management, and State and private lands in the Craig Mountains, Idaho.

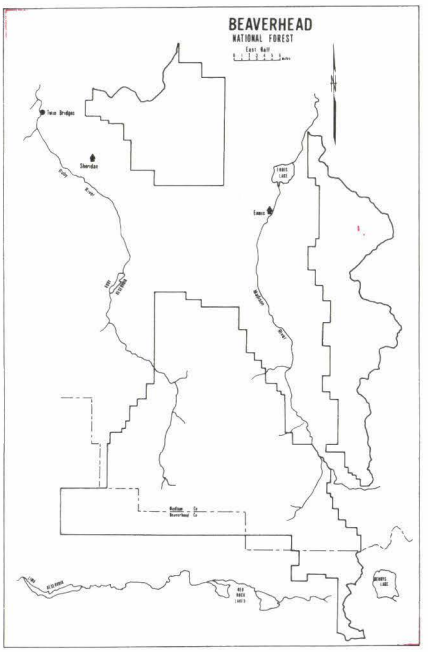
BEAVERHEAD NATIONAL FOREST

Infestation continued to decline throughout the Forest in 1984 (Table 1). Chronology of infestation is shown in Figure 1. Approximately 38,000 acres of lodgepole pine type and 3,600 acres of high elevation whitebark pine were infested in 1984, compared to 65,222 acres of lodgepole and 4,202 acres of whitebark pine in 1983. Less than one-half infested tree per acre occurs within areas delineated during annual aerial surveys in 1984 . Active infestation still exists in the North Fork of Meadow Creek drainage on the Madison RD. Active timber sales to remove old-growth lodgepole should reduce beetle populations to endemic status by 1985. Smaller, 2- to 50-tree groups occur from the South Fork of Meadow Creek north to Town Creek in the Tobacco Root Mountains. A continued decline is predicted for the infestation on the Madison RD and for infested stands in the Centennial Mountains. Since 1974, more than 7,100 acres have been brought under management in an effort to reduce hazard. During the 10-year period (1974-84), sanitation-salvage harvests have removed 80.5 MMBF of merchantable volume.

More than 16,000 acres of high-risk lodgepole pine type exist on the Wisdom and Wise River RD's, and there is another 175,404 acres of moderate hazard type that is approaching the high-hazard class. Management plans should be developed for these stands and implemented to bring susceptible stands under management to prevent epidemics from developing.

Table 1.--Acres infested by host type, by Ranger District, Beaverhead National Forest, 1973-1984.

	RANGER DISTRICT									
	Madison		Sheridan		Wise River		State, private other		Total acres	
Year	LPP	WBP	LPP	WBP	LPP	WBP	LPP	WBP	LPP	WBP
1973	160								160	
974	780								780	
1975	2,400								2,400	
1976	8,482								8,482	
1977	15,800								15,800	
1978	62,072	5,303							62,072	5,303
1979	95,102	3,231							95,102	3,231
1980	73,538	10,410							73,538	10,410
1981	19,425	450	140			80	62,840	30	82,405	560
1982	89,634	5,642	80		120		44,397	894	134,231	6,536
1983	57,737	2,922	200				7,285	1,280	65,222	4,202
1984	27,325	3,162	123				10,624	477	38,072	3,639



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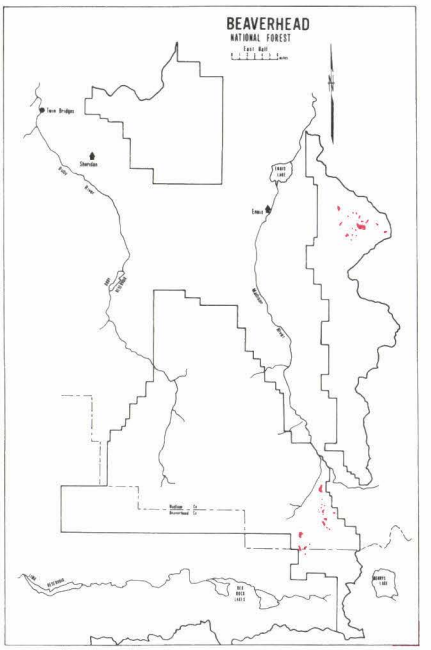

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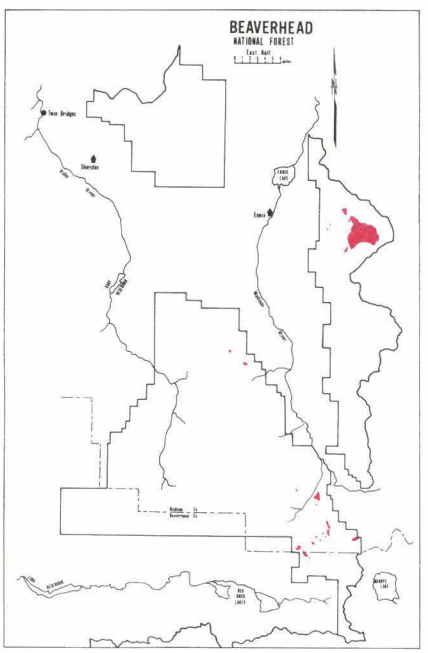

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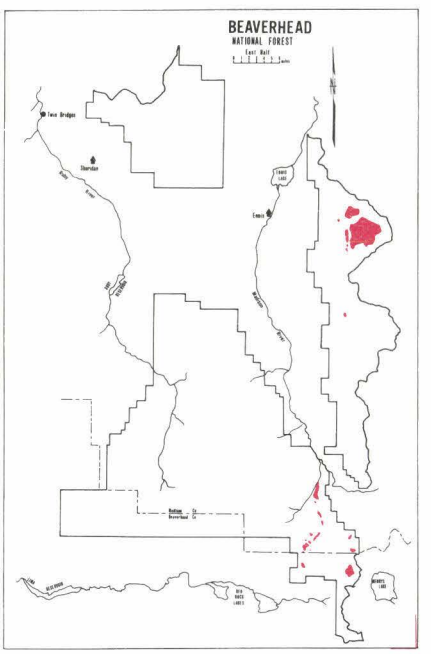

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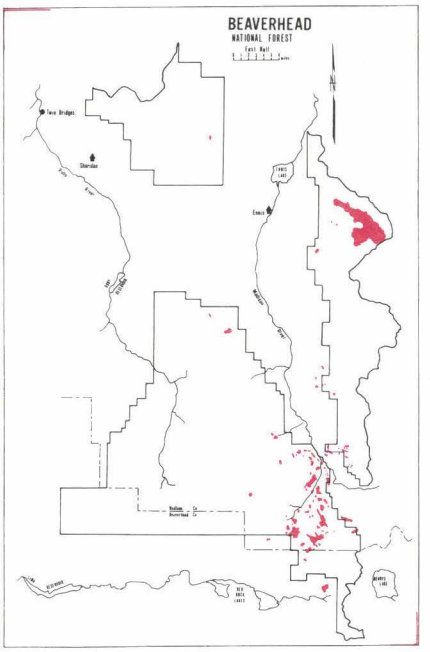
Figure 1.--Chronology of mountain pine beetle infestation, Beaverhead National Forest, Montana, 1973-1984.



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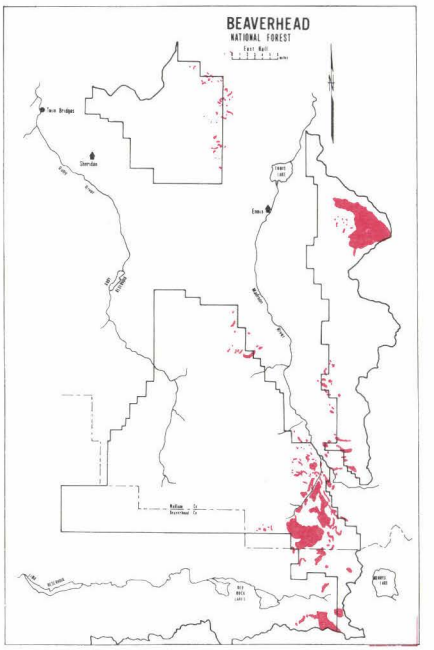

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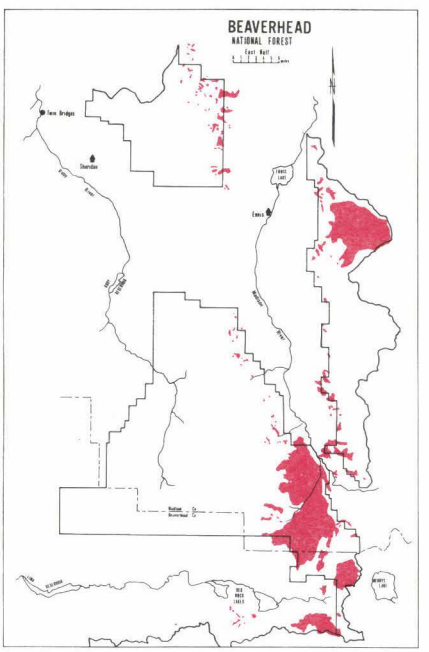

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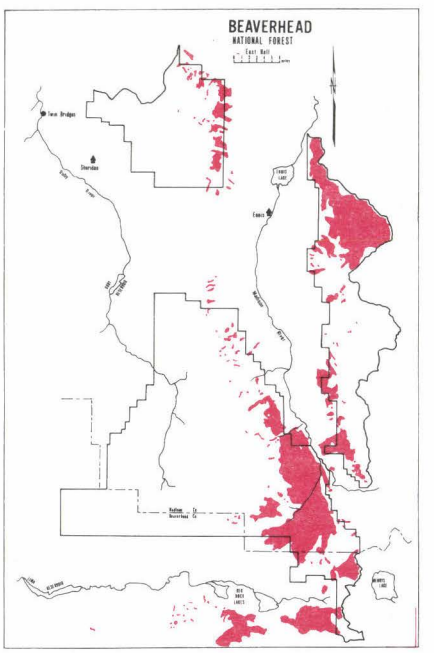

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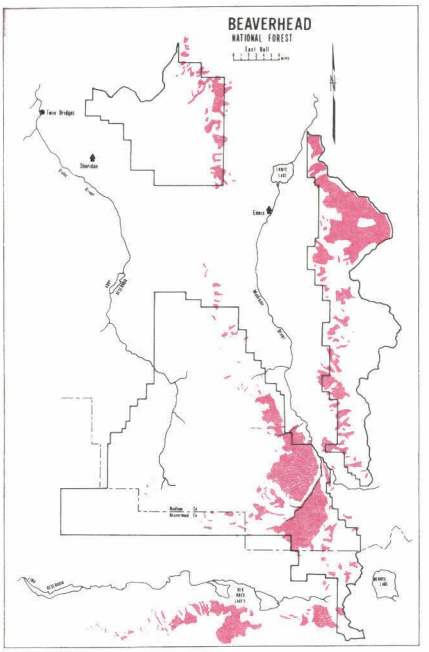
Figure 1 cont.



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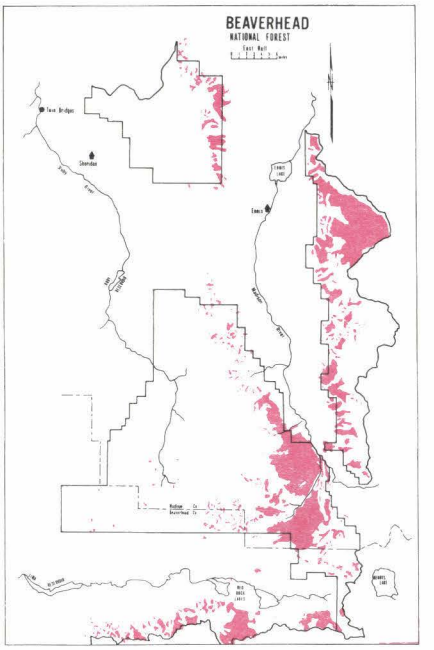

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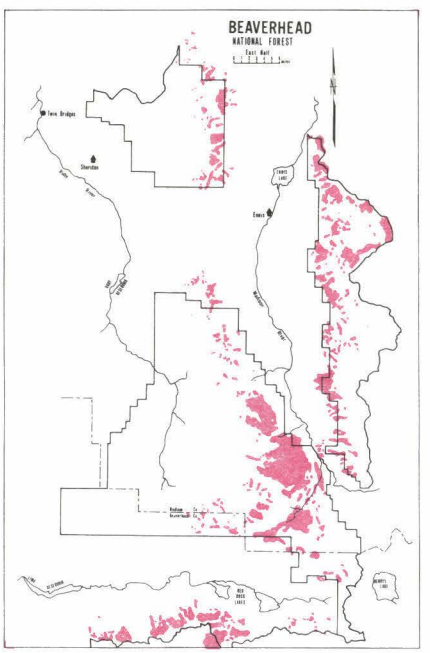

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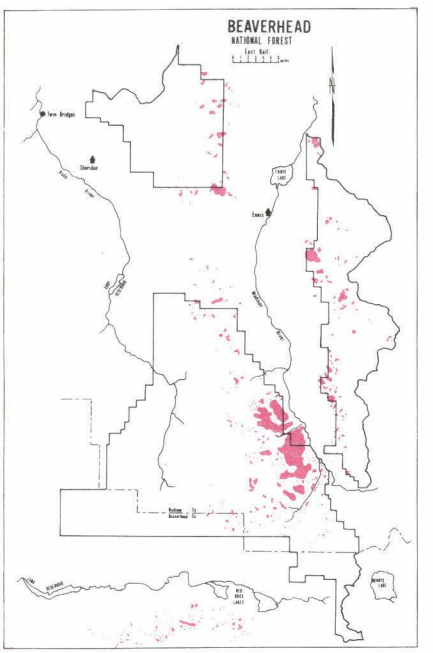


1984

Figure 1 cont.

BITTERROOT NATIONAL FOREST

Infestation has increased in lodgepole pine and ponderosa pine stands on the Forest the past several years (Table 2, Figure 2). A notable increase occurred in lodgepole pine stands in and around Dennis Mountain since 1980. New group kills of 1-700 trees/group occur in ponderosa pine from Thirteen Mile Creek north to Whitecap Creek and in tributaries along the Selway River drainage. Ponderosa pine group kills occur from Mud Creek down the West Fork Bitterroot River drainage to Shook Mountain, West Fork RD, and in many tributaries in the East Fork Bitterroot River drainage, Sula RD. Several hundred ponderosa pines were killed in 5- to 250-tree groups from Levens Gulch north to McKinney Gulch on the Darby RD. Scattered mortality occurred in Spring Basin and Granite Creek in second-growth ponderosa pine stands, Stevensville RD.

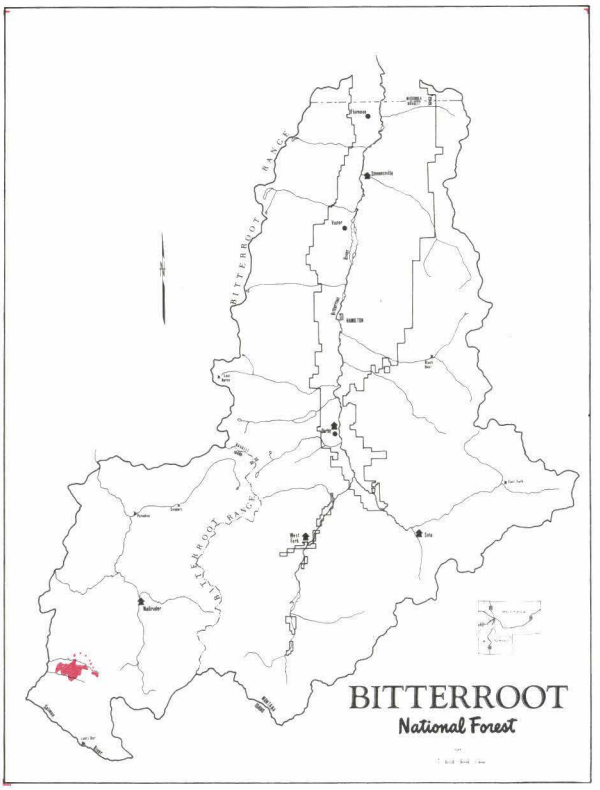
Table 2.--Acres of mountain pine beetle infestation by host type by Ranger District, Bitterroot National Forest 1980-1984.

	RANGER DISTRICT								
	Darby		Sula		Stevensville	W. Fork		State & private	Total	
Year	LPP	PP	LPP	PP	PP	LPP	PP	PP	LPP	PP
1980		535		4	1	600	200	1,235	600	1,975
1981		600	80			1,100	150	300	1,180	1,050
1982						80		2,286	80	2,286
1983		509		700	430	3,761	508	4,165	3,761	6,312
1984		1,043	41	357		3,965	266	2,413	4,006	4,079

Infestation is predicted to increase, particularly in the lodgepole pine type. The large infestation in the Selway Bitterroot Wilderness will continue to expand and infest high-risk stands on the West Fork RD within the next few years.

Active sales removed 7.0 MMBF from 600 acres in 1984. Increased sales are planned for high-risk stands beginning in 1985.

A-



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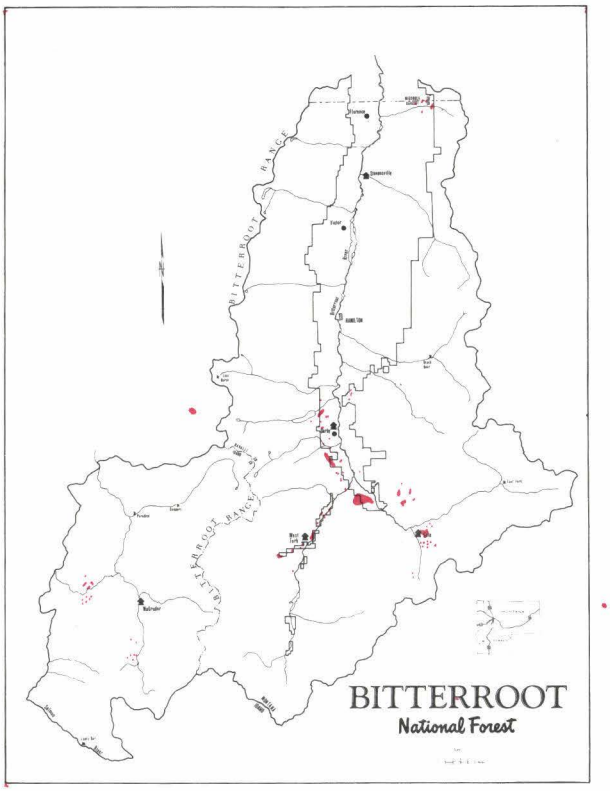
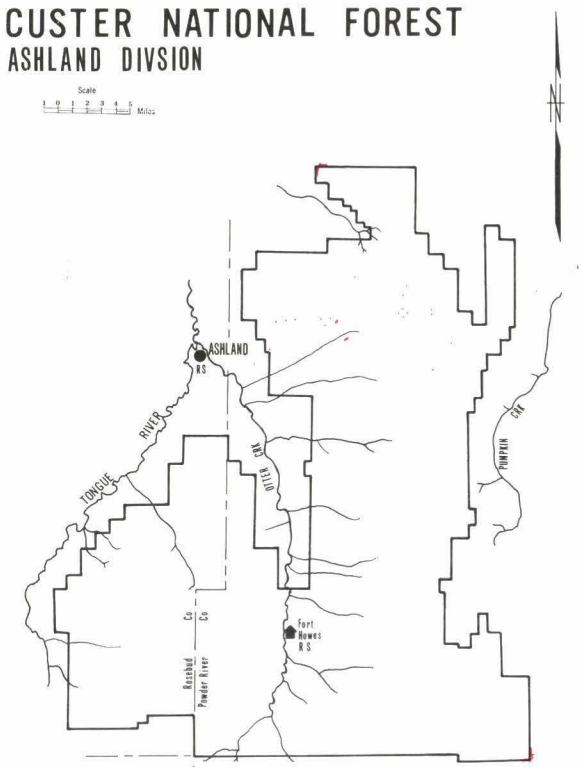


Figure 2.--Mountain pine beetle infestation, Bitterroot National Forest, Montana, 1984, A-Lodgepole pine, B-Ponderosa pine.

CUSTER NATIONAL FOREST

Widely scattered tree mortality occurred in ponderosa pine stands between Home Creek and Liscom Butte, Ashland RD (Figure 3A). More than 70 MBF of lodgepole pine and 150 MBF of whitebark pine have been killed on the Beartooth RD since 1980 (Figure 3B). Scattered ponderosa pine mortality occurred on more than 1,400 acres in the Long Pines unit and in the Chalk Buttes in 1984. More than 46 MBF have been killed on 8,300 acres during the last 5 years (Figure 3C). Populations are predicted to remain static or increase in 1985.

A-



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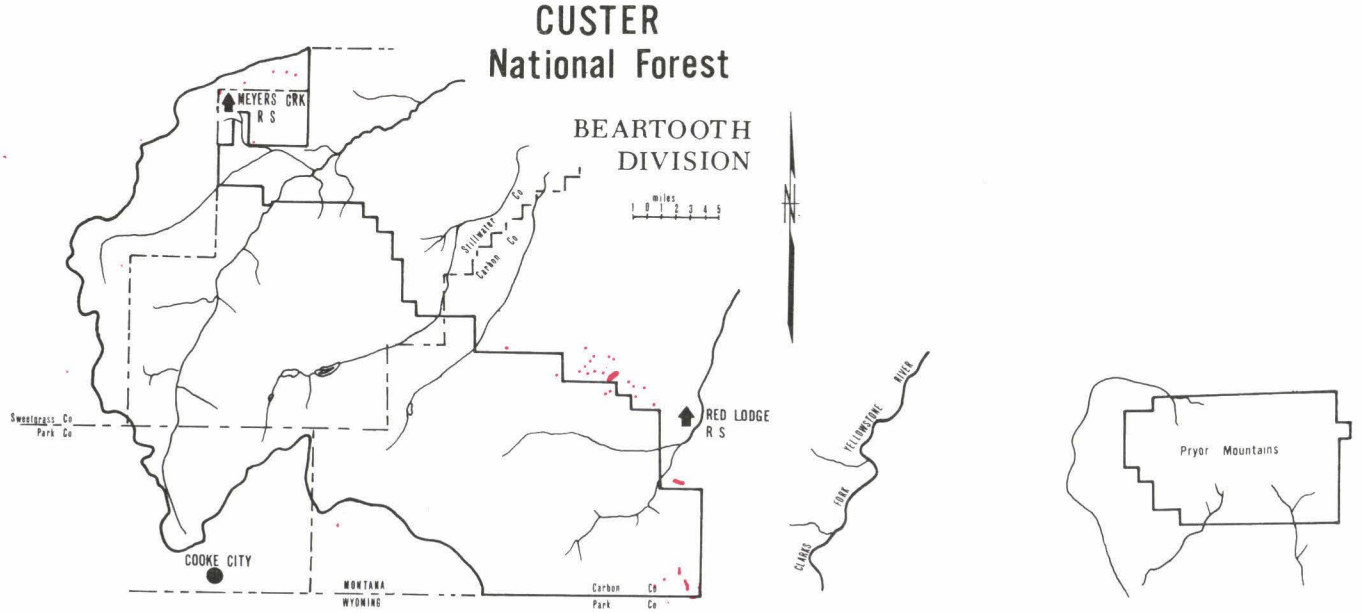


Figure 3.--Mountain pine beetle infestation, Custer National Forest, Montana, 1984, A-Ashland Ranger District, B-Beartooth Ranger District, C-Sioux Ranger District.

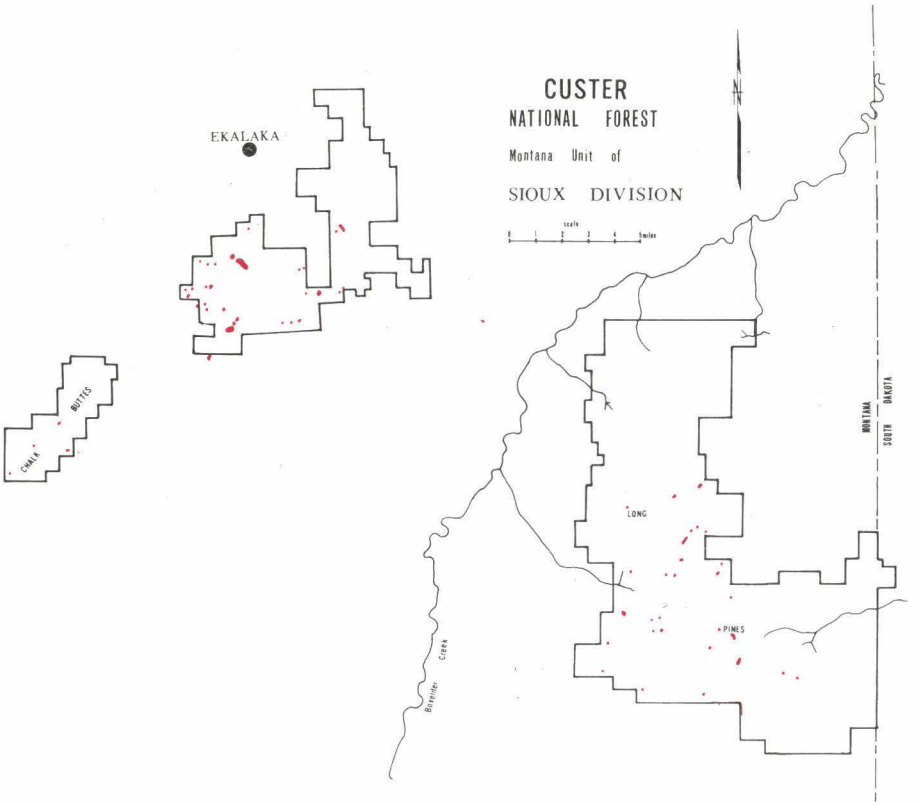


Figure 3 cont.

DEERLODGE NATIONAL FOREST

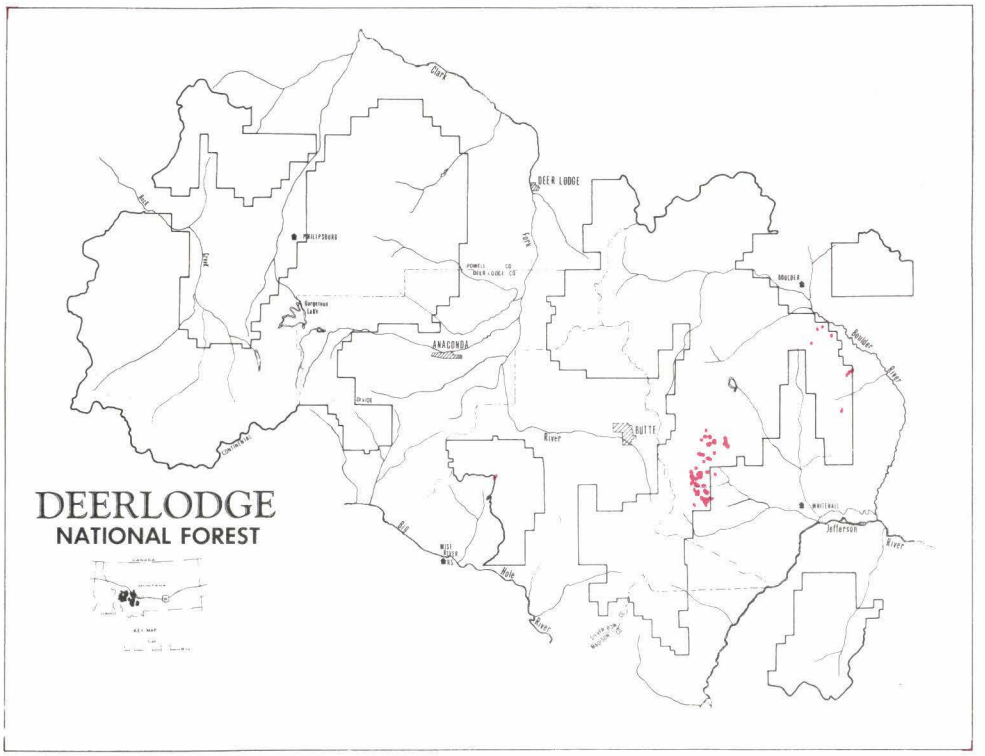
The infestation was first detected in 1981 in high-risk lodgepole pine stands on 850 acres near Homestake Pass. More than 7,800 acres of lodgepole pine type were infested on the Jefferson and Philipsburg RD's, and adjoining State and private lands by 1984 (Figure 4). Small groups of lodgepole pine faders, 5- to 25-trees/group, occur in Climax Gulch, South Fork of Willow Creek, Henderson Creek, Upper Willow Creek, Cow Creek, and Orofino Mountain, Philipsburg RD. Nearly 2,500 trees/infested area were killed between Halfway Park and Bald Mountain in the Homestake Pass area directly east of Butte, Montana (Table 3). Trees killed/acre declined from 1983 to 1984 due to mortality of beetle broods from cold temperatures during winter.

Table 3.--Acres infested by host type by Ranger District, Deerlodge National Forest 1981-1984.

	RANGER DISTRICT								Total acres	
	Deerlodge		Jefferson	Butte		Phillipsburg	State & private			
Year	LPP	WBP	LPP	LPP	WBP	LPP	LPP		LPP	WBP
1981	850	40			30				850	70
1982			520						520	
1983			700						700	
1984	34		6,329	71		114	501		7,873	

High-hazard stands encompass more than 49,000 acres on the Forest. Should beetle populations continue to expand as has been the pattern on other eastside Forests, all high-hazard lodgepole pine type could become infested within the next 6-8 years. Management to reduce stand susceptibility and thinning to prevent loss in low- and moderate-hazard stands are recommended in the immediate future.

Where roads access high-hazard stands and where new system roads are planned, pheromone baiting of susceptible stands would help to confine beetles to areas where proposed sales are implemented. In inaccessible susceptible stands, funnel trapping or lethal trap trees may prolong infestation buildup and tree mortality until areas can be roaded and stands put under management. Area infested and tree mortality will increase in 1985.



1983

1984

Figure 4.--Mountain pine beetle infestation, Lodgepole pine, Deerlodge National Forest, Montana, 1983-1984.

FLATHEAD NATIONAL FOREST

Infestation was first detected in the North Fork Flathead River drainage in 1975. Since then, infestations have built up in place and beetles have immigrated from heavily infested adjacent stands on the Kootenai, and Lolo NF's, and in Glacier National Park. Acres of lodgepole pine type infested increased steadily from 1,135 in 1975 to 185,950 in 1984 (Table 4). Since 1980, the most dramatic increase in infested acres and tree mortality occurred on the Island Unit of the Swan RD, throughout the Tally Lake RD, and in lodgepole pine stands on adjacent State and private lands. Mortality of old-growth ponderosa pine and western white pine has increased the past 3 years where these species were adjacent to or mixed with heavily attacked lodgepole pine stands. Chronology of infestation is shown in Figure 5.

Mortality in lodgepole and whitebark pine stands has subsided to near endemic status with widely scattered tree mortality occurring in higher elevation whitebark stands along the Whitefish Divide on the Glacier View RD. Mortality in old-growth white pine stands persists in Canyon Creek, Glacier View RD, with about 200-300 trees killed in 1984.

Pheromone baiting combined with sanitation/salvage logging and funnel trapping did much to reduce tree mortality in lodgepole and western white pine stands around Hungry Horse Reservoir, Hungry Horse RD.

Infested area increased more than twofold in lodgepole pine type killing more than 2 million trees on the Tally Lake RD during 1984.

Also, infestation increased in lodgepole pine stands on the Swan and Spotted Bear RDs with more than 900,000 trees killed during 1984. A fourfold mortality increase in ponderosa pine stands occured on adjacent State and private lands.

Infestation declined by a third from 1983 to 1984 on the Stillwater State Forest. However, tree mortality will probably increase as beetle populations continue to expand on the adjacent Tally Lake RD.

In an effort to concentrate beetles, 1,300 pheromone baits were applied to lodgepole and western white pine in 45 stands on 1,250 acres in 1984. Through March 1984, 30 of the 45 stands continuing 18 MMBF were removed. The remaining stands were logged prior to beetle flight in 1985.

In an effort to reduce the onslaught of beetle-caused mortality, 755 MMBF of merchantable volume have been removed from 49,639 acres since 1979. Of this, 230 MMBF were green lodgepole pine and 19 MMBF were dead. The remainder of the volume was nonhost species in the treated stands.

Risk rating of lodgepole pine stands is continuing on the Swan and Tally Lake RD's to set priorities for harvesting high-risk stands.

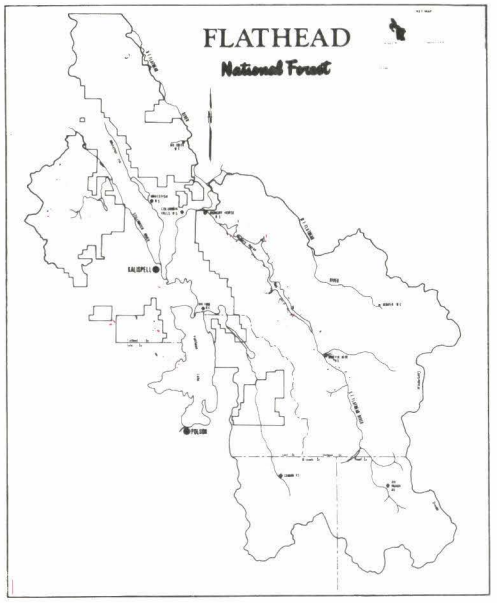
Although infestation has declined on the Glacier View and Hungry Horse RD's, a continued increase in area infested and tree mortality is predicted on Tally Lake, Swan, and Spotted Bear RD's. Table 5 depicts current status and trend data from biological evaluation plots from various RD's.

Table 4.—Acres infested by host type by Ranger District, Flathead National Forest, 1975-1984.

Ranger District	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Glacier Vw.										
LPP	80	1,213	12,913	48,494	61,780	85,160	88,314	32,408	2,274	676
WBP		192			22,426	93,525	7,100	17,694	12,626	892
WWP		5	20	25	150	420		30	1,185	269
PP										
Hungry Horse										
LPP	300	5			20	21,567	8,738	1,475	2,185	394
WBP								800		80
WWP	500	150	450	350	1,218	600	5,376	150	858	851
PP										
Spotted Bear										
LPP		30	20	25	20	3,070	1,300	50	60	364
WBP								140		13
WWP	75	20			50	50	900	82	80	113
PP			100							
Swan Lake										
LPP			4		25		650	1,420	14,634	17,681
WBP				150	2	310		850		21
WWP	15				150		3		300	
PP	90	261		25	1	30	2			12
Tally Lake										
LPP	5				100	12,840	9,620	6,370	22,567	56,976
WBP										
WWP					1					1
PP	70									3
Stillwater State For.										
LPP			50	400	643	10,035	1,000		7,140	2,172
WBP		195	40		489		100			
WWP					250		1,270	243		1
PP				738					70	74
Private Lands										
LPP		2,424	14,697	30,042	35,292	89,980	65,637	28,989	85,911	91,861
WBP					178	1,281	3,050	200		
WWP								380		12
PP		40	20	1,266	977		300		3,901	13,493
Total	1,135	4,535	28,314	81,515	123,772	318,868	193,360	91,281	153,791	185,959

Table 5.--Trees killed per acre by mountain pine beetle and trend prediction for Ranger Districts, Flathead National Forest, Montana.

Ranger District	Host	Trees killed per acre				Trend
		Older	1983	1984	Total	
Glacier View	No evaluation done					Declining-Endemic
Hungry Horse	LPP	24.4	17.5	4.5	46.4	Static
	WWP	46.1	7.3	11.1	64.5	Declining
Swan Lake	LPP	34.4	30.6	51.2	116.2	Increasing
Tally Lake	LPP	42.6	38.8	38.8	120.2	Increasing



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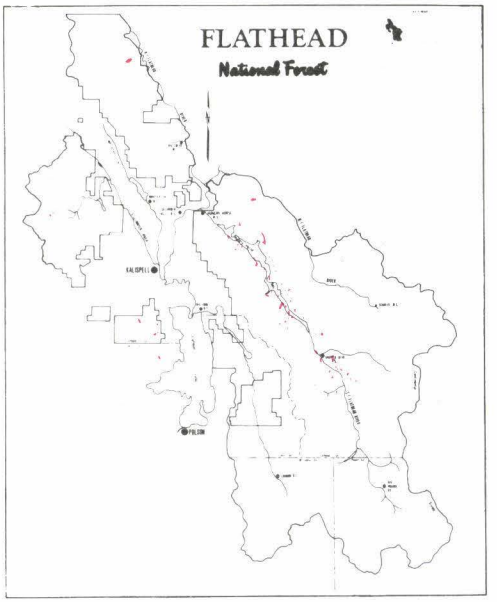

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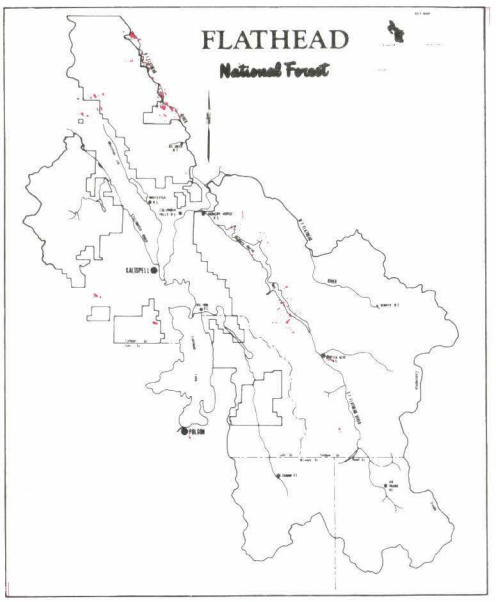

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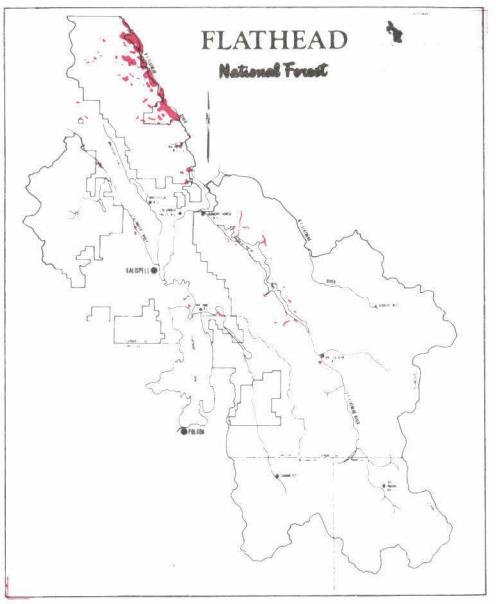

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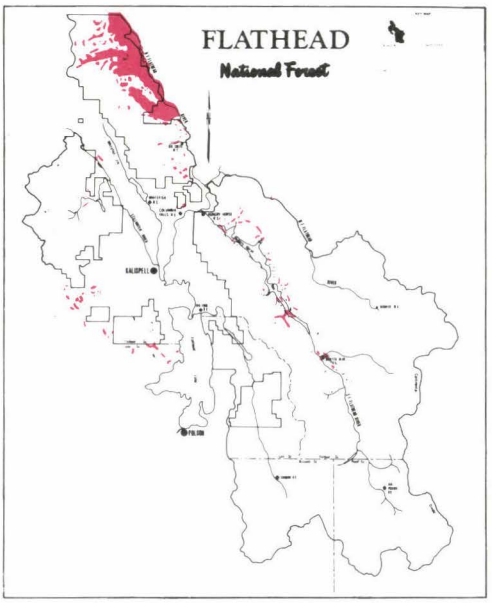
Figure 5.--Chronology of mountain pine beetle infestation, Flathead National Forest, Montana, 1974-1984.



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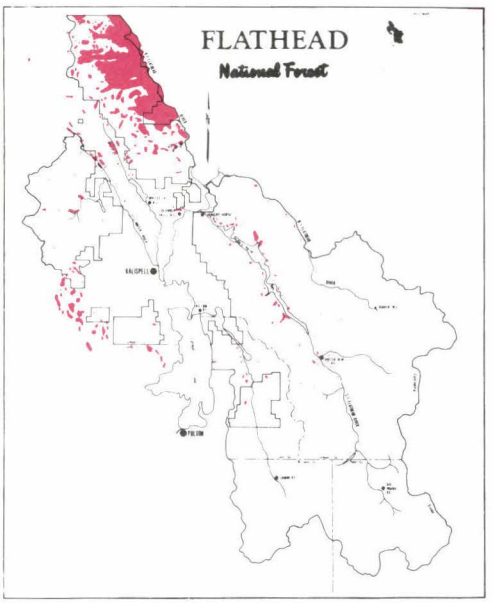

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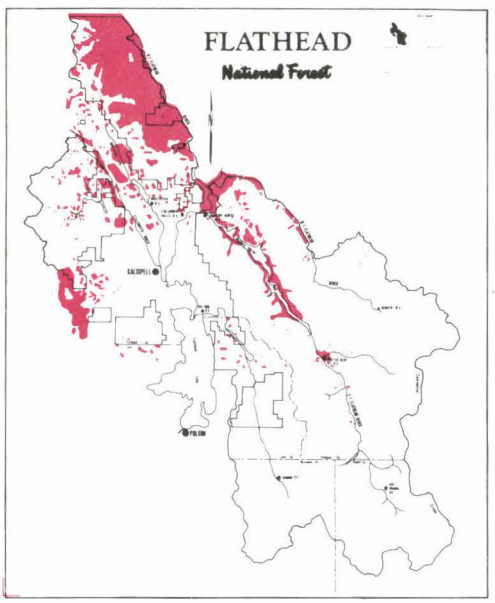

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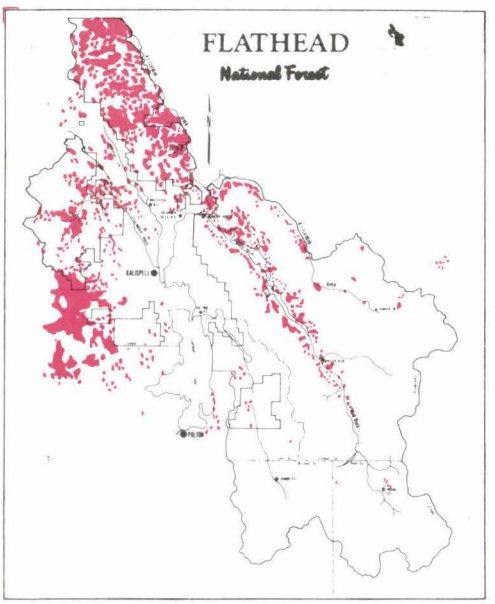

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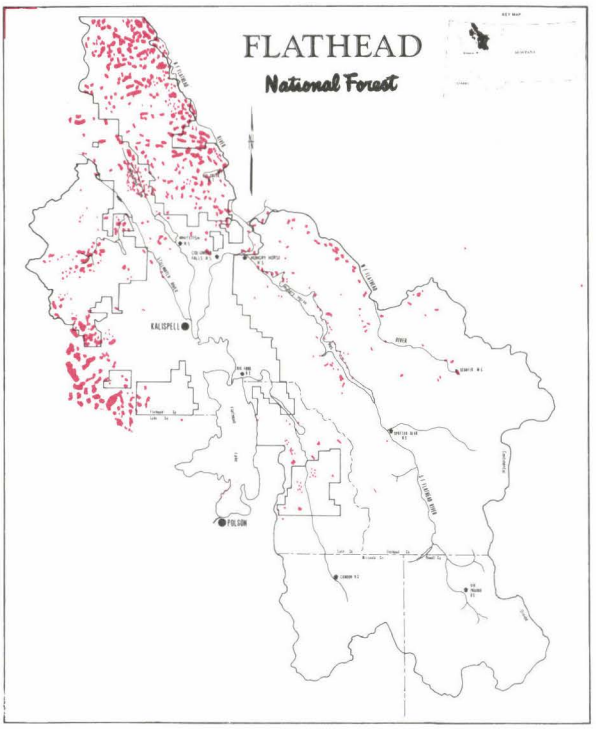
Figure 5 cont.



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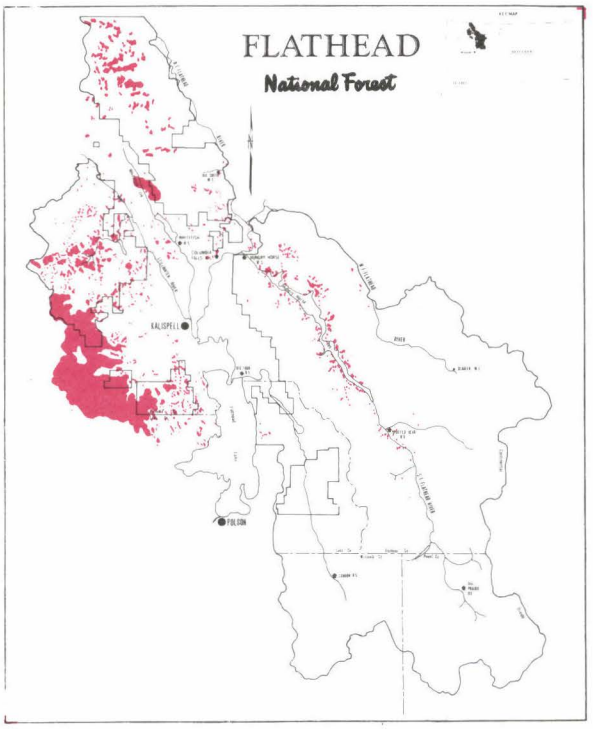

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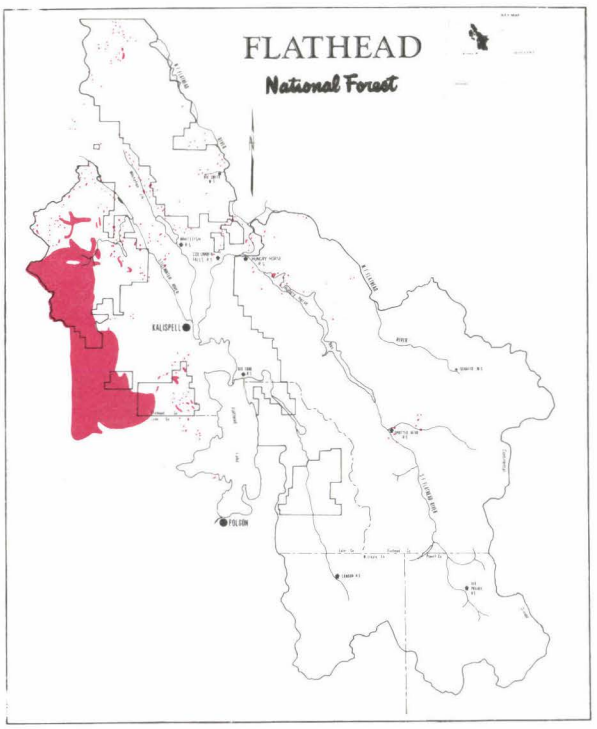


1984

Figure 5 cont.

GALLATIN NATIONAL FOREST

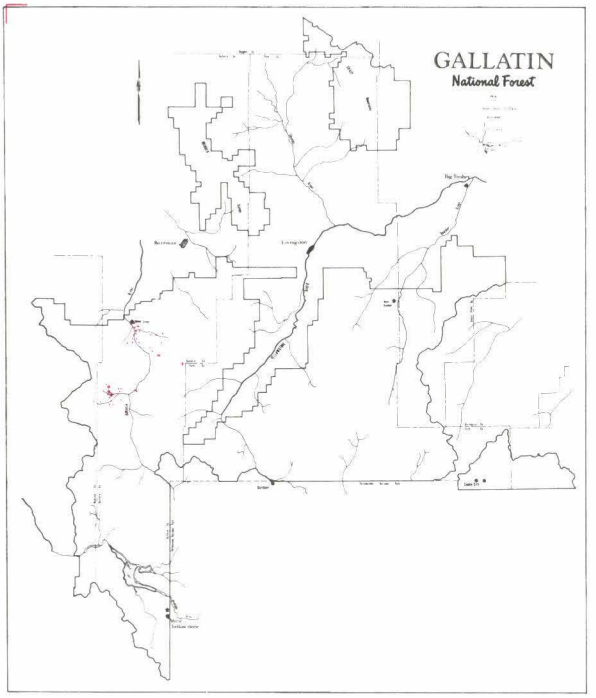
Beetle populations began developing in lodgepole pine stands in 1969. Outbreaks were first observed in low-elevation stands across from Squaw Creek Guard Station, Bozeman-Gallatin RD, and along the southern portion of the Hebgen Lake RD. Infestation continued to increase and by 1978, 525 MMBF had been killed on 224,000 acres. Infestation continued to spread in intensity and by 1982, 638,511 acres (Table 6) were infested with an estimated 14,117,647 trees containing 1.2 billion bd. ft. killed since the outbreak began. The outbreak had declined to 228,192 acres by 1984. Chronology of infestation is shown in Figure 6. The infestation continued to decline on the Gardiner, Bozeman-Gallatin, and Hebgen Lake RD's, and in stands on adjacent State and private lands. Infestation increased on the Big Timber, Livingston, and eastern portions of the Bozeman-Gallatin RD.

Sanitation/salvage harvests began in 1977. Through 1984, 18,700 acres were treated resulting in a harvest of 147.5 MMBF of merchantable lodgepole pine. A continued decline in beetle activity is predicted for the western portion of the Forest. However, additional mortality is predicted for susceptible stands on the Big Timber and Livingston RD's, and eastern portions of the Bozeman-Gallatin RD's in 1985.

Table 6.--Acres of lodgepole pine type infested by Ranger District, Gallatin National Forest, 1969-1984.

	RANGER DISTRICT							
Year	Big Timber	Livingston	Gardiner	Bozeman	Gallatin	Hebgen	State & private	Total acres
1969					50			50
1970					720			720
1971					1,860			1,860
1972					3,050			3,050
1973					5,600			5,600
1974					6,400	4,480		10,880
1975					8,830	41,240		50,070
1976					52,179	59,244	21,523	132,946
1977				3,382	95,035	78,634	47,820	224,871
1978				16,216	97,312	79,061	52,110	244,699
1979	5	3,326	381	50,775	174,306	103,702	108,716	441,211
1980	80	26,235	5,420	63,408	124,795	103,152	221,089	554,179
1981	1,309	49,180	25,571	62,643	195,027	124,253	180,537	638,520
1982	120	39,739	33,149	55,340	198,647	105,443	140,000	572,432
1983	127	24,694*	31,496*	16,071*	83,146*	33,152	77,096*	265,783
1984	313	35,727*	27,975*	23,692*	64,415*	7,339*	68,794*	228,255

*Includes whitebark pine.



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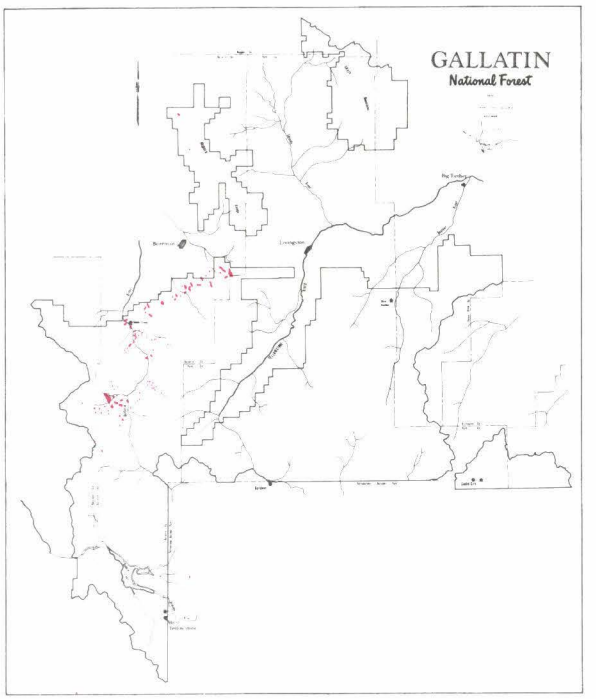

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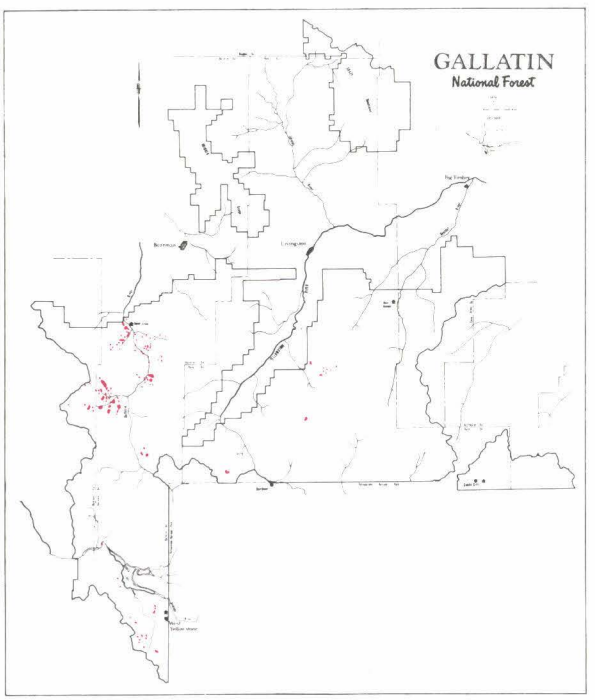

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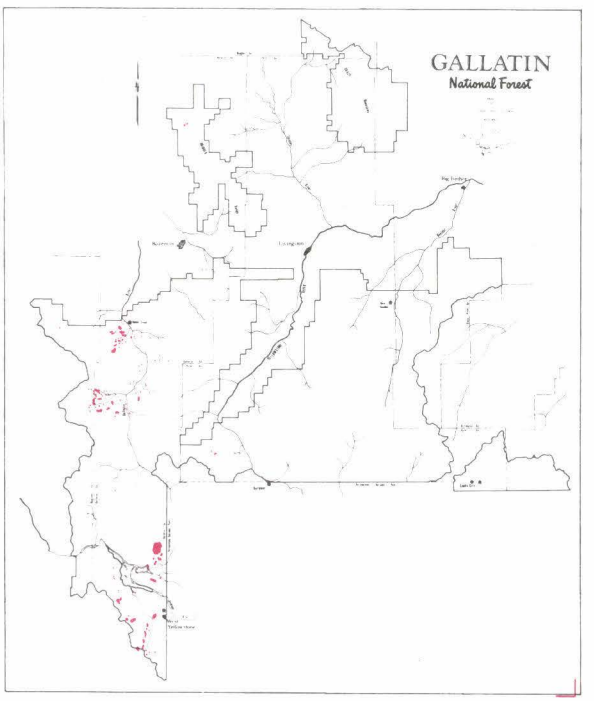
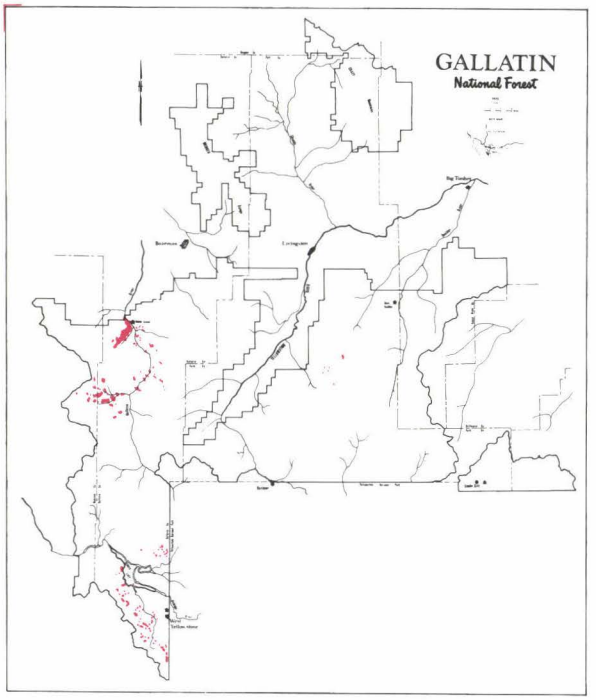


1973

Figure 6.--Chronology of mountain pine beetle infestation, Gallatin National Forest, Montana, 1970-1984.



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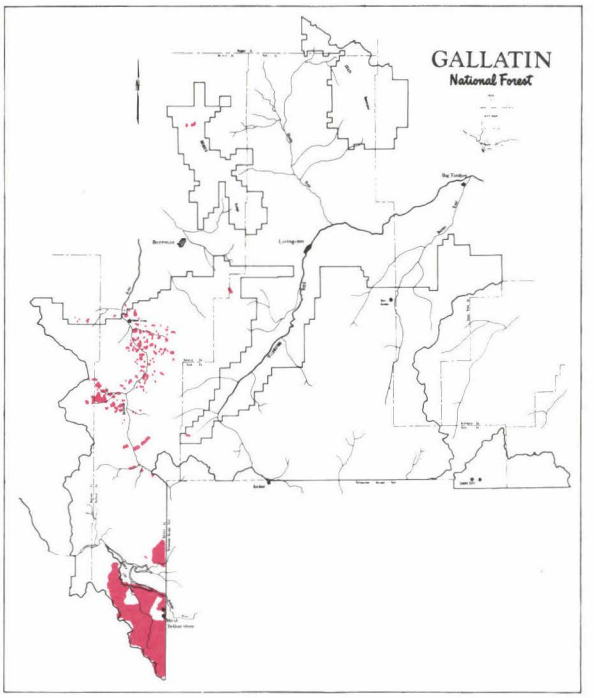

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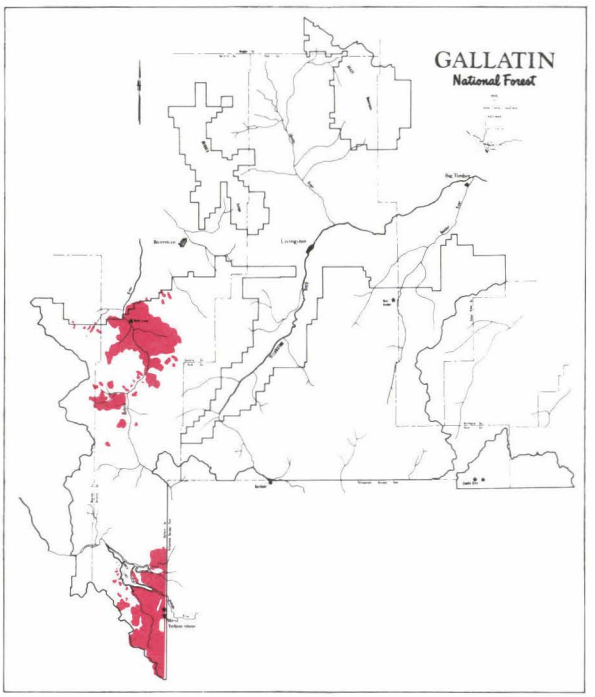

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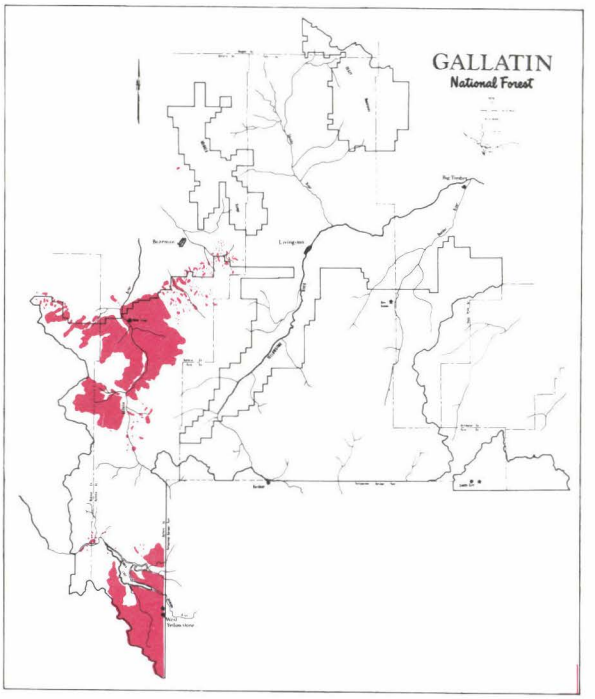

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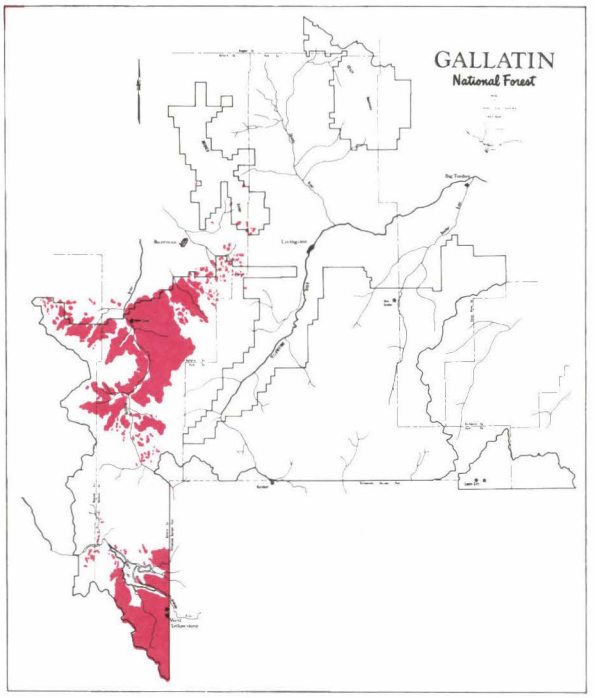

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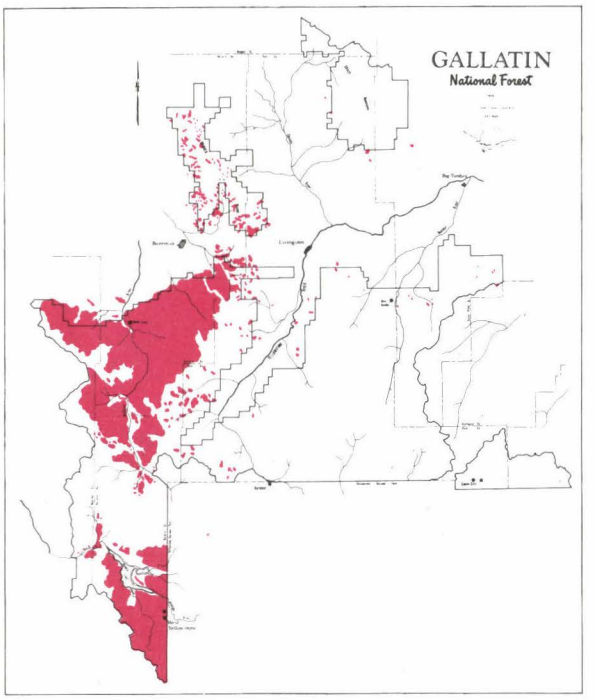

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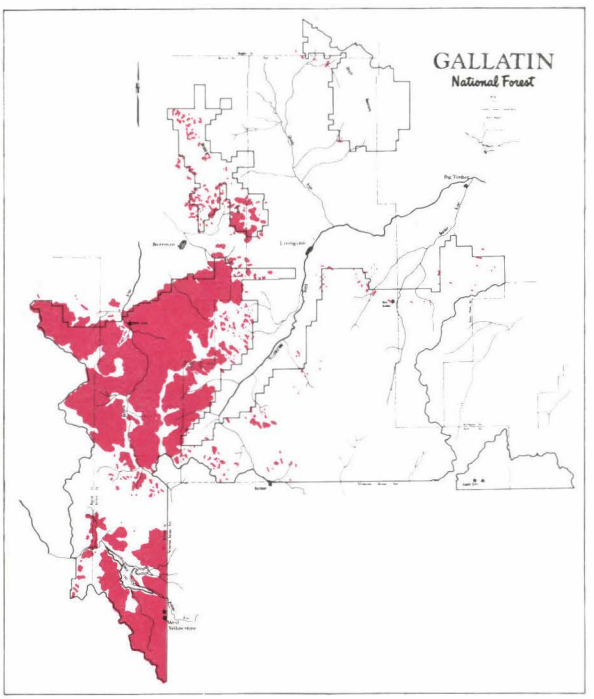

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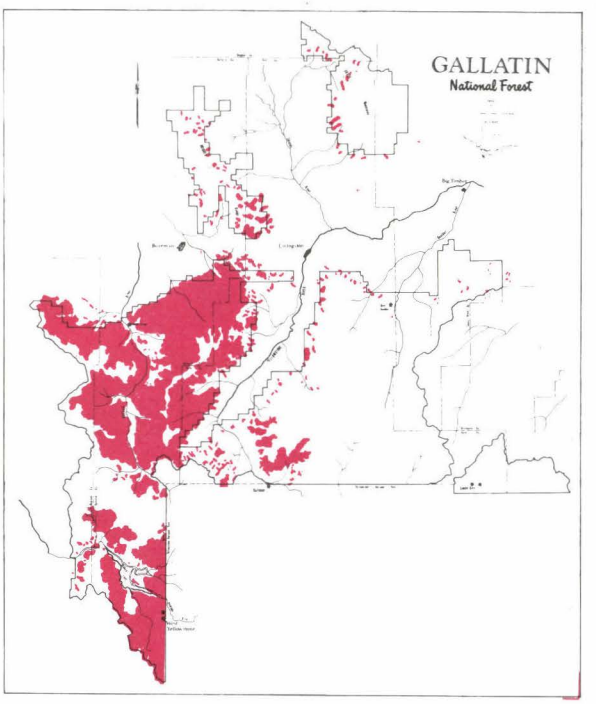

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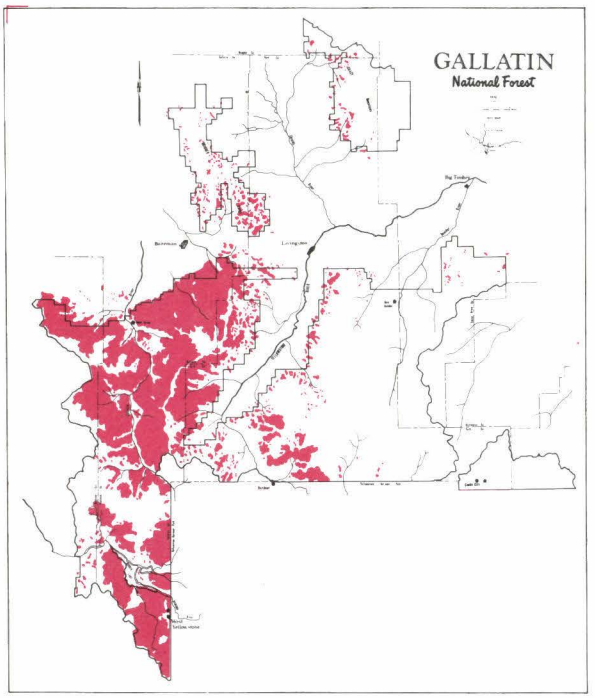
Figure 6 cont.



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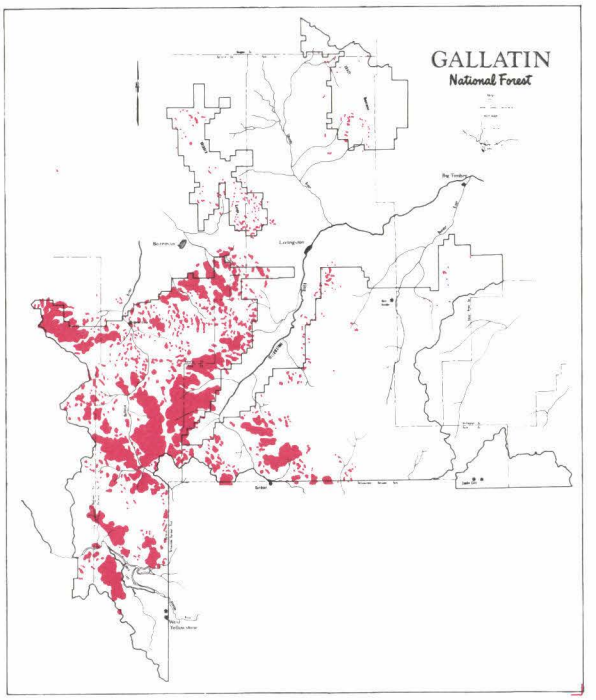

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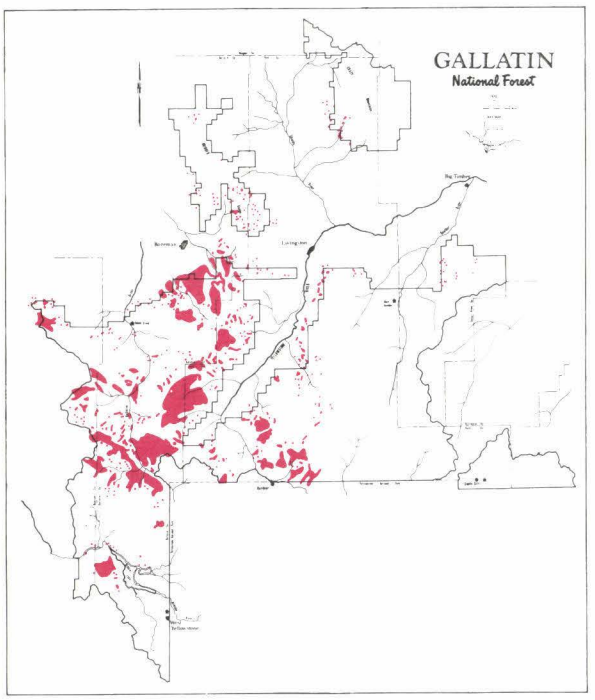


1984

Figure 6 cont.

HELENA NATIONAL FOREST

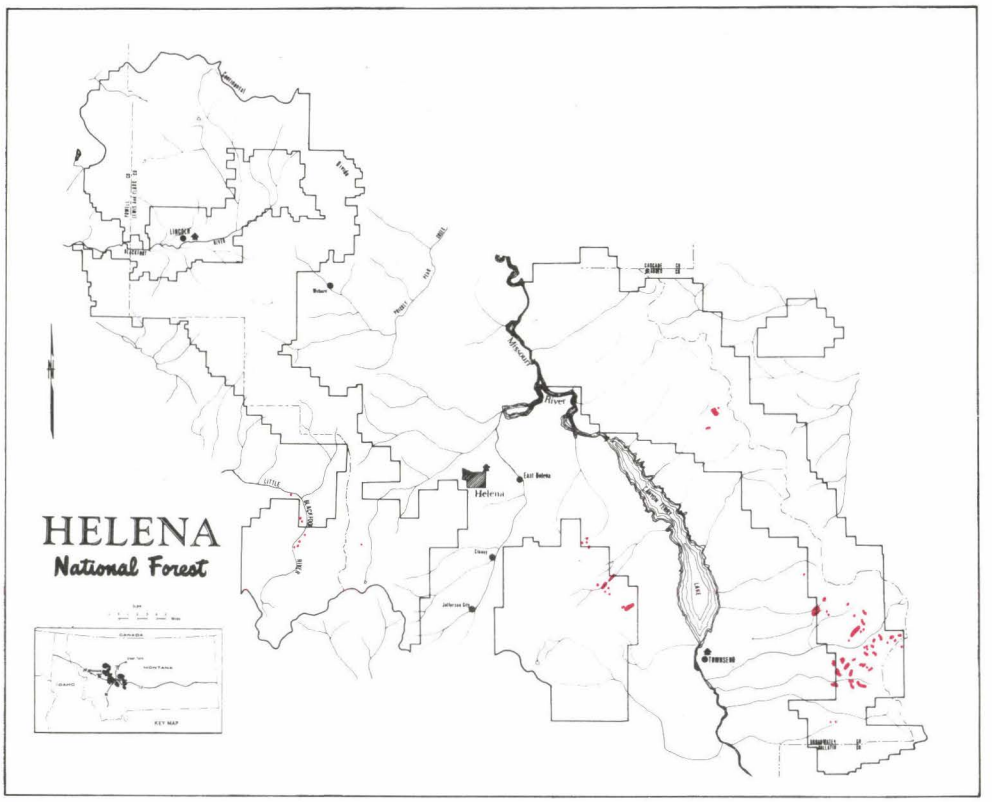
Mountain pine beetle has been active on the Helena and Townsend RD's since 1978. More recently, infestations have developed in lodgepole pine stands on the Canyon Ferry RD and adjacent State and private lands (Figure 7). Mortality of lodgepole and whitebark pines was observed on 2,884 acres in 1984, compared to 487 acres in 1983 (Table 7). Infested groups of 5-30 trees occurred in Lincoln and Theodore drainages, and nine groups of ponderosa pine were killed in the South Fork of Wolf Creek, Lincoln RD, in 1984. Mortality of lodgepole pine has persisted for almost 10 years between Rays Creek and Black Butte, Townsend RD. About 300 trees were killed in scattered groups in Sawmill, Beaver, and South Fork of Beaver Creek in newly developing infestations on the Helena RD.

More than 7,000 acres of high-risk lodgepole pine type exist on the Forest, and 141,000 acres of moderate-risk stands are approaching the high risk category. Stand management practices such as thinning and creation of a mosaic of age and size classes would do much to thwart a developing epidemic. Although buildup ratios show a decline from 1983 to 1984, size of area infested increased sevenfold throughout the Forest. Infestation is predicted to intensify and increase in high-risk lodgepole pine stands during 1985.

Table 7.--Acres infested by host type by Ranger District, Helena National Forest, 1978-1984.

	RANGER DISTRICT							
	Canyon Ferry	Helena			Lincoln	Townsend	State & private	
Year	LPP	LPP	WBP	PP	LPP	LPP	LPP	Total acres
1978			453	200	225	535		
1979			895	428	400	725		
1980			185			776		
1981		340	30					370
1982						290	90	501
1983	100					163	224	487
1984	131			2		1,858	841	2,884

A-



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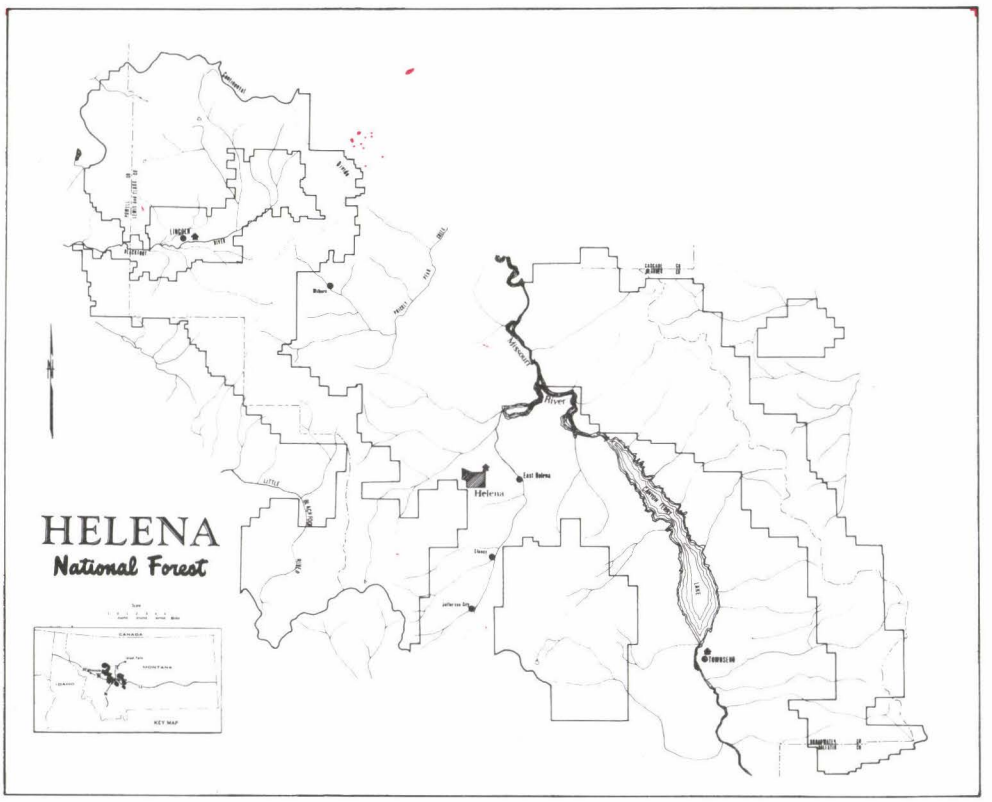


Figure 7.--Moutain pine beetle infestation, Helena National Forest, Montana, 1984, A-Lodgepole pine, B-Ponderosa pine.

KOOTENAI NATIONAL FOREST

A significant increase in tree mortality occurred on all RD's in 1984 (Table 8). The infestation, which began in 1972 on the Yaak RD, continues to devastate high-risk lodgepole pine--increasing from 145,671 acres in 1983 to 608,227 acres and killing more than 11 million trees in 1984. Chronology of infestation on the Kootenai NF is shown in Figure 8. Besides the increase in mortality of lodgepole pine, increased mortality was observed in old-growth ponderosa pines in stands adjacent to heavily infested lodgepole pine stands on the Fortine, Libby, and Rexford RD's.

Table 8.--Acres infested by host type by Ranger District, Kootenai National Forest, 1975-1984.

District	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Cabinet RD										
LPP						250		210		2,324
WBP										0
WWP	2,000		1							1
PP	10			25		100				3
Fisher River RD										
LPP	270	860	610	1,610	3,904	13,610	25,770	32,547	37,046	177,617
WBP	15									0
WWP										10
PP	130		2	30	410	80	200	80	400	2,949
Fortine RD										
LPP				50	360	1,160	3,090	4,642	3,053	38,691
WBP							120	500	530	210
WWP								40		151
PP	100				150					23
Libby RD										
LPP	370	275	450	589	1,720	970	800	770	2,143	16,898
WBP		10								3
WWP	30									408
PP	60		1		25	140	100			366
Rexford RD										
LPP	100	401	576	1,167	1,868	3,350	4,800	7,482	5,442	29,758
WBP	120									90
WWP	30									25
PP	30	2								12
State & private										
LPP					7,796	19,648	33,080	50,075	2,337	224,511
WBP										0
WWP							30			11
PP					30	220	650		10	6,566
Troy RD										
LPP										229
WBP										0
WWP										87
PP										8
Yaak RD										
LPP	5,110	18,894	15,572	19,820	32,951	64,656	74,315	73,817	54,504	107,449
WBP										0
WWP										22
PP	660		20							0
TOTAL	9,035	20,442	17,232	23,291	49,214	104,184	142,955	170,163	105,465	608,422

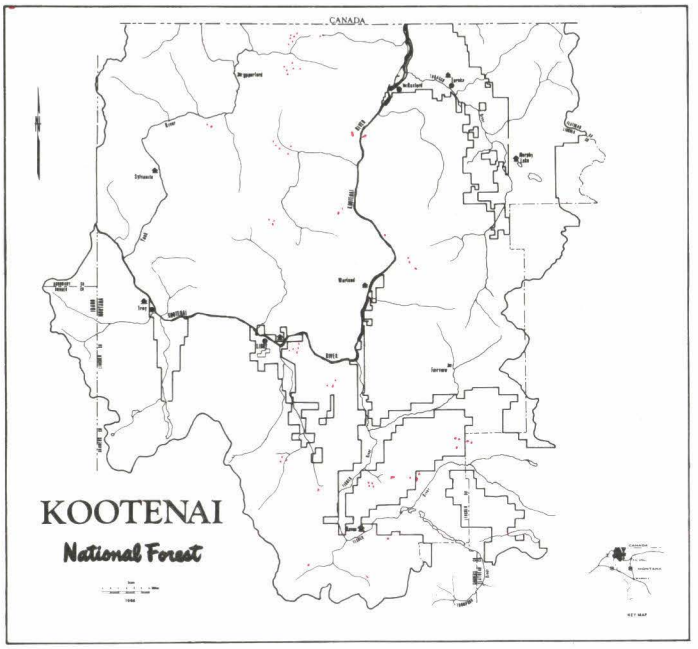
Data from biological evaluations of infested areas on each RD are shown in Table 9.

Table 9.--Lodgepole pine killed/acre and predicted infestation trend for lodgepole pine stands by Ranger District, Kootenai National Forest, Montana.

RD	Trees killed/acre				Trend prediction
	Older	1983	1984	Total	
Cabinet	16.5	2.5	22.4	41.4	Increasing
Fisher River	48.6	25.4	41.0	115.0	Increasing
Fortine	24.8	13.1	11.6	49.5	Increasing
Libby	44.0	1.0	8.0	53.0	Increasing
Rexford	7.7	4.7	4.3	16.7	Increasing
Yaak	45.0	9.1	24.2	78.3	Increasing

Since the outbreak began in 1972, extensive sanitation/salvage logging and removal of high-risk, green stands have prevented mortality in many areas. About 530 MMBF of merchantable lodgepole pine have been removed from 63,000 acres since 1975. Pheromone baiting was initiated in 1984 to concentrate beetles in stands scheduled for harvest. About 3,000 pheromone baits were applied to 40 lodgepole pine stands on 300 acres in 1984. Thirty stands were logged through March 1985, and the remainder were logged prior to beetle flight in 1985.

Tree mortality and area infested are predicted to intensify on all Districts in 1985.



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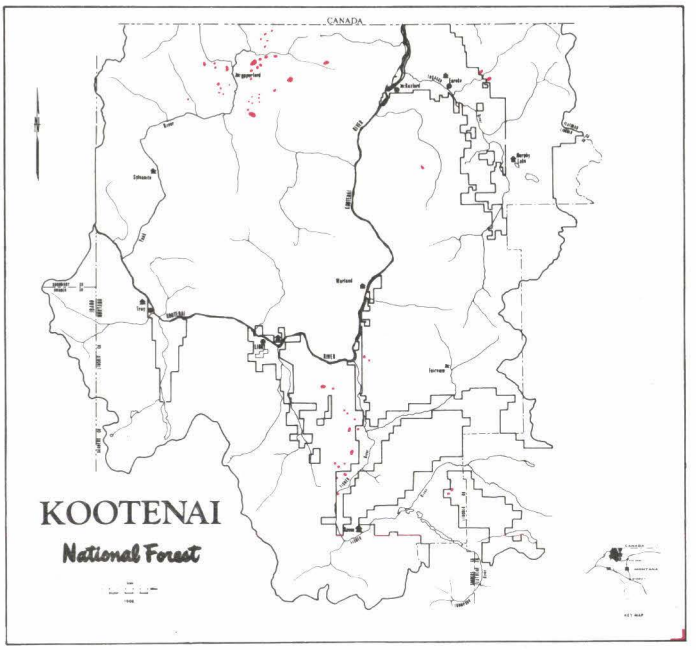

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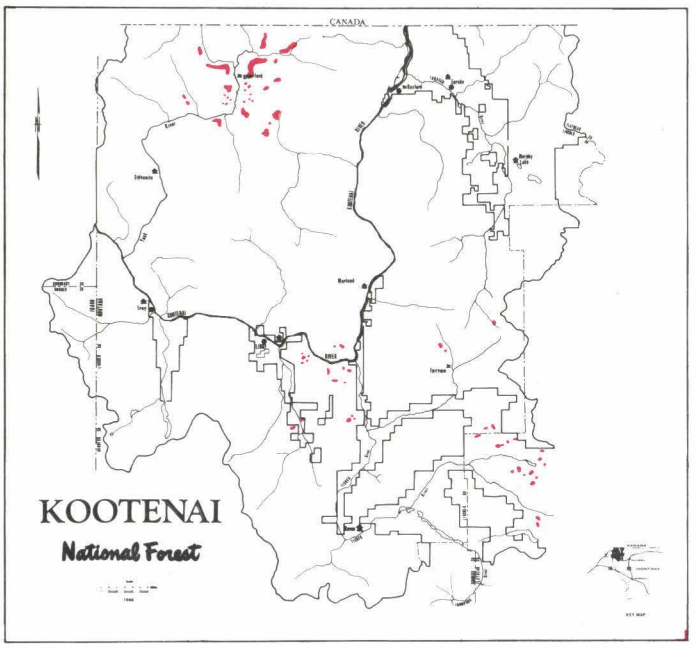

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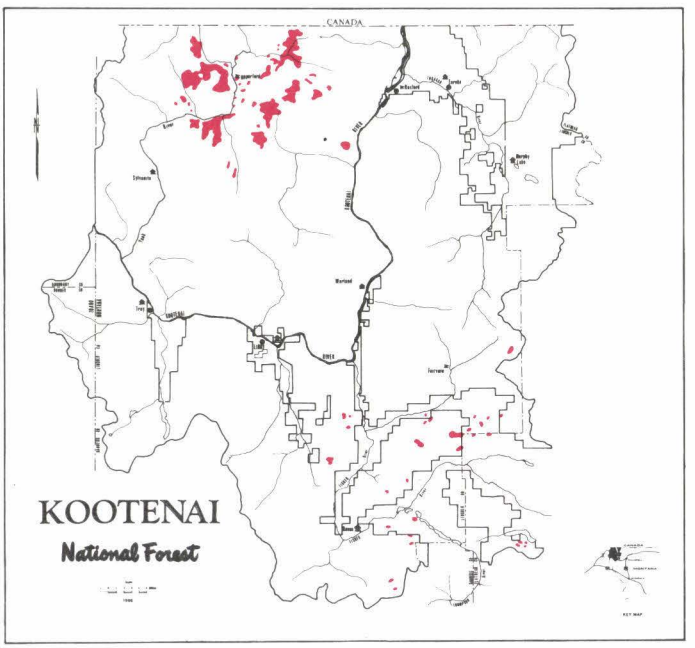
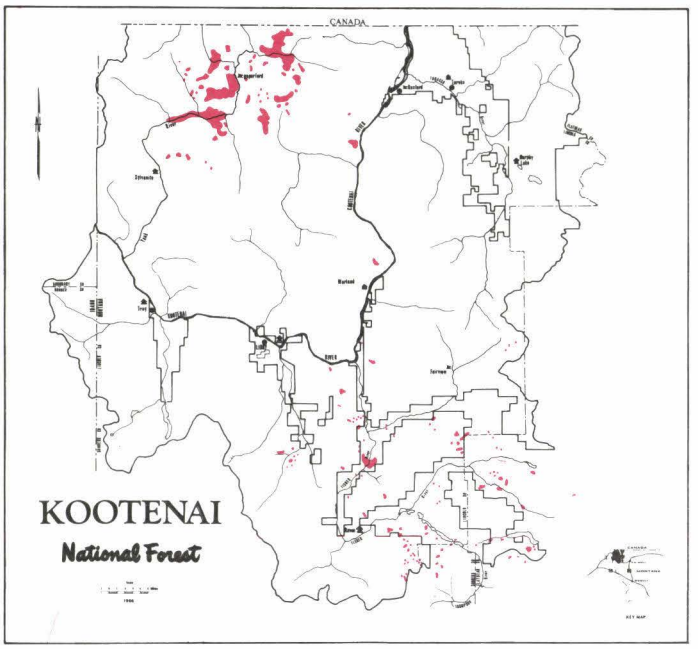


1976

Figure 8.--Chronology of mountain pine infestation, Kootenai National Forest, Montana, 1973-1984.



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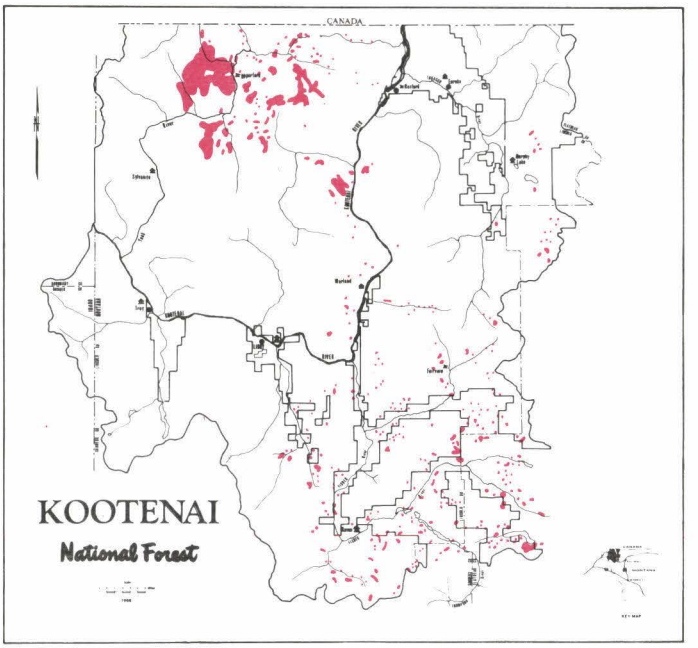

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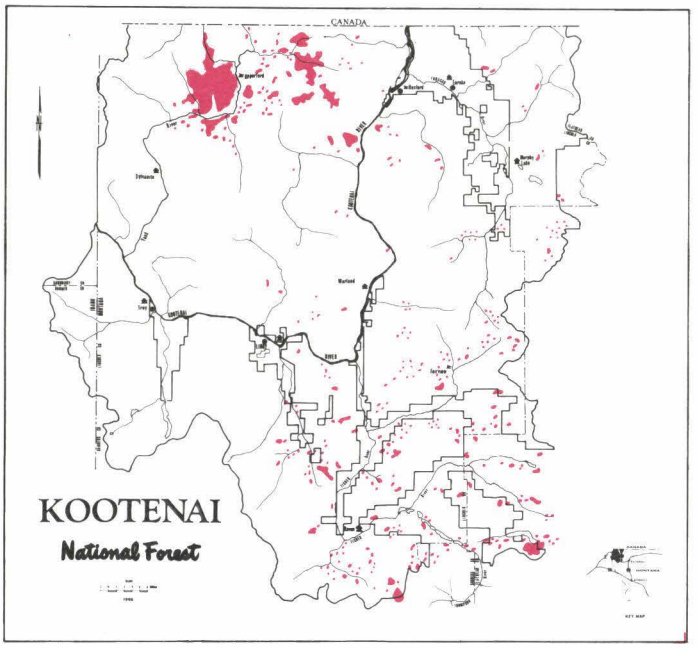

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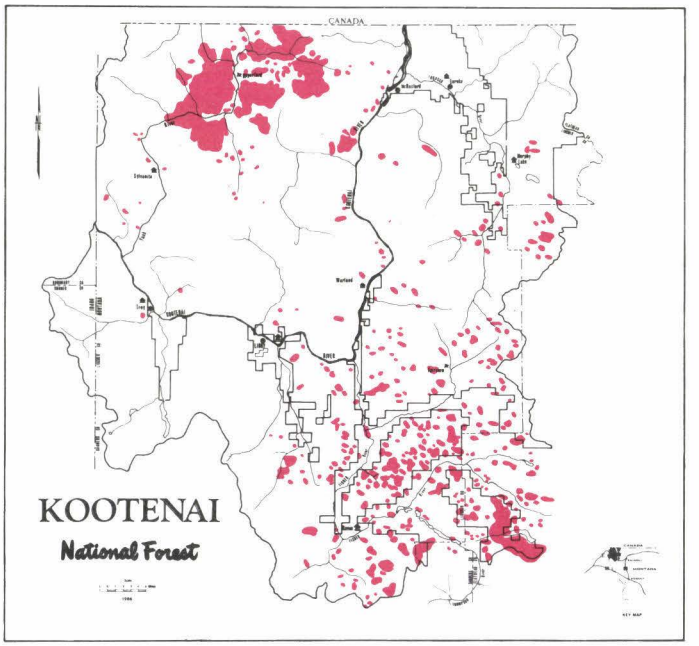

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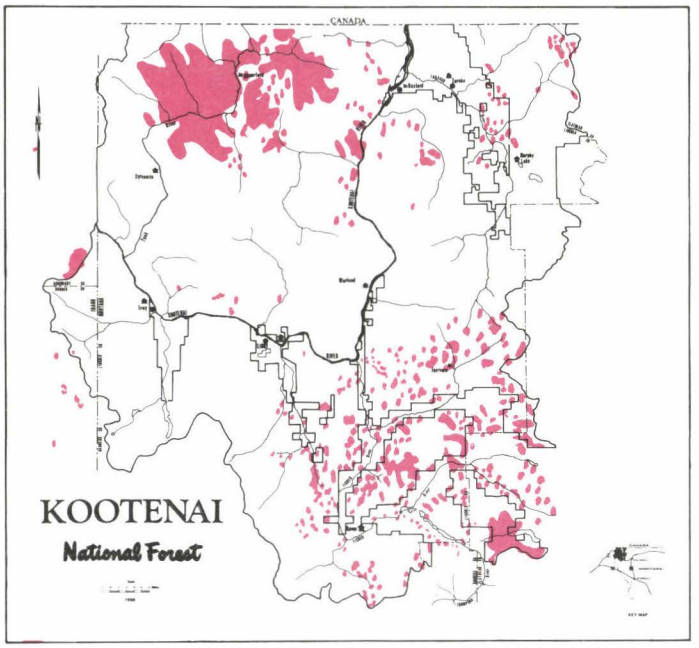

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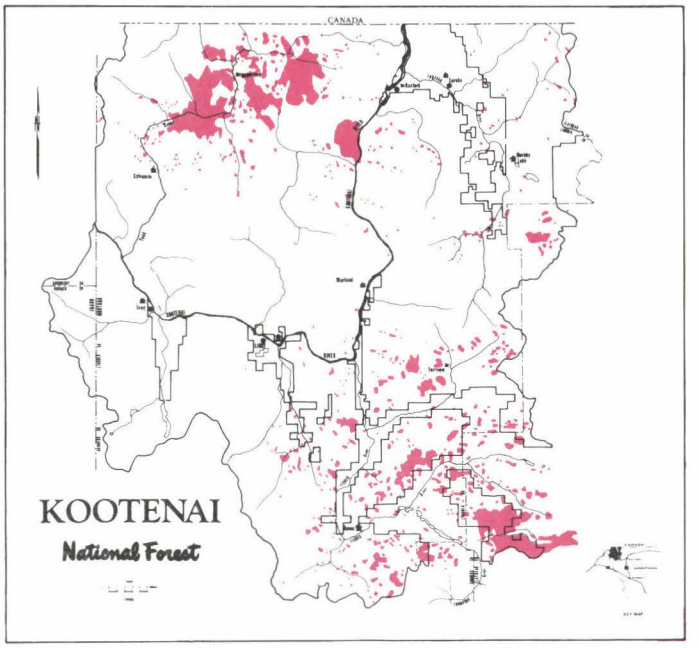

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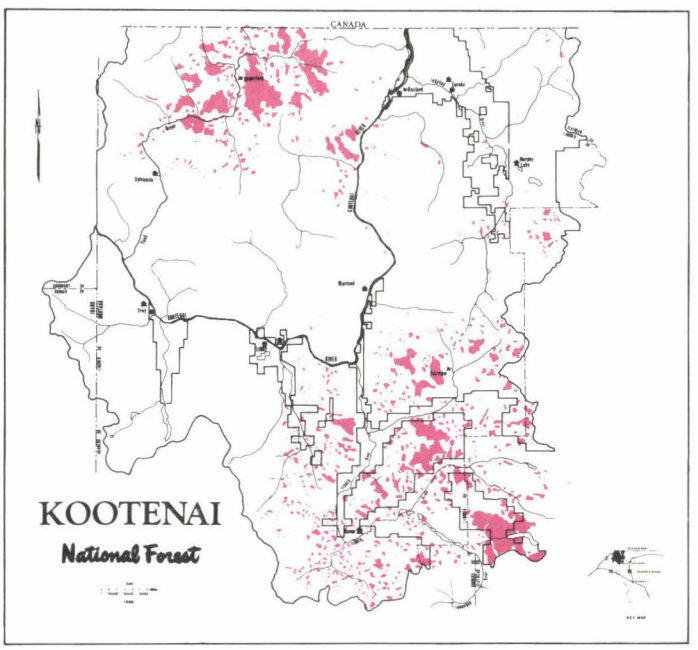

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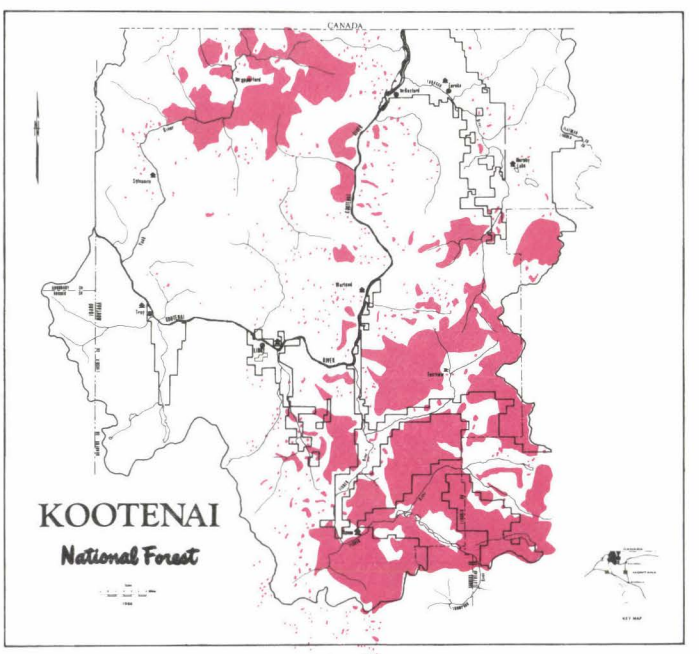


1984

Figure 8 cont.

LEWIS & CLARK NATIONAL FOREST

Infestation in ponderosa and lodgepole pine type has declined since 1977 (Table 10). Active infestation persists on only 1,299 acres of ponderosa pine and 369 acres in lodgepole pine type in 1984 (Figure 9), compared to more than 81,000 acres in 1977. Incipient infestation persists in ponderosa pine stands between the South Fork of Yogo Creek and Willow Creek drainages, Stanford RD; and several small groups of lodgepole pine were killed between Willow Reservoir and Warm Springs Creek, White Sulphur Springs RD in 1984. Since 1980, 9.2 MMBF of ponderosa pine have been killed. In an effort to bring second-growth stands under management, 5.6 MMBF of ponderosa pine from 1,364 acres have been removed through timber sales.

Table 10.—Acres infested by host type by Ranger District, Lewis & Clark National Forest, 1978-1984.

	Belt		Judith		Musselshell		White Sulphur Springs	State & private		Total	
Year	LPP	PP	LPP	PP	LPP	PP	LPP	LPP	PP	LPP	PP
1977				81,800							81,800
1978				1,600					62,800		64,400
1979				4,200			200		11,171	200	15,371
1980				50					6,300		6,350
1981					30	10,132	200		43,546	230	53,678
1982					20	17,660			78,069	20	95,729
1983				758	30	300		40	568	70	1,626
1984		80	100	684	81	100	5	183	435	369	1,299

Even though beetle populations and infested areas are at a low ebb at the present time, nearly 200,000 acres of high-hazard lodgepole pine stands occur on the Forest and another 156,000 acres of moderate-hazard stands are fast approaching high-hazard class. Unless these stands are put under management, we predict mountain pine beetle epidemics are imminent. Hazard ratings by District are shown in Table 11.

Table 11.--Hazard rating for lodgepole pine stands, Lewis & Clark National Forest.

Ranger District	Low	Moderate	High
Belt	45,068	30,003	55,665
Judith	3,771	15,182	7,260
Musselshell	13,219	11,312	33,110
Rocky Mountain	44,957	68,458	4,576
White Sulphur	33,477	30,859	92,951
TOTAL	140,492	155,814	193,562

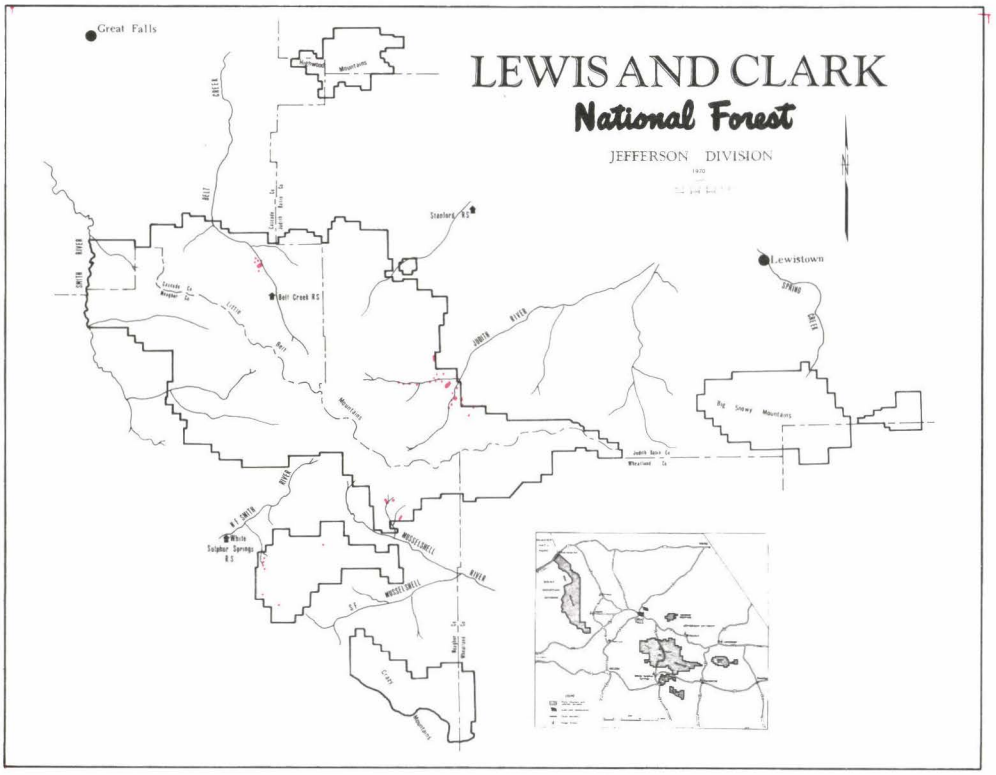


Figure 9.--Mountain pine beetle infestation, Lewis and Clark National Forest, Montana, 1984.

LOLO NATIONAL FOREST

The current epidemic began in 1975 in the Thompson River drainage, Plains RD. Since that time, infested acres have fluctuated yearly. More than 1 million trees were killed on about 42,450 acres in 1984 (Table 12).

Infestations declined steadily in ponderosa pine stands on the Missoula RD since 1981. New infestation was detected in lodgepole pine stands in 1983.

Infestation increased from 720 acres in 1982, to 2,088 acres in 1984 on the Ninemile RD. Epicenters occurred in Upper Ninemile and Mill Creek drainages. More than 27,600 acres of high-hazard lodgepole pine stands are infested on the Plains RD. New outbreaks developed on 340 acres of lodgepole pine type in 1983 and increased to 2,089 acres in 1984 on the Superior RD. Mortality of lodgepole pine occurs on 7,315 acres of State and private lands within the Forest boundary. Mortality of whitebark pine, western white pine, and ponderosa pine increased where these species are mixed or are adjacent to epidemic infestation in lodgepole pine stands. Chronology of infestation on the Lolo National Forest is shown in Figure 10.

Infestation increased in second-growth ponderosa pine stands in the Blackfoot River drainage east of Missoula, Montana (Figure 11).

Since 1977, 196 MMBF of lodgepole pine have been removed from 19,620 acres in an effort to reduce loss in high-hazard green stands and to salvage mortality. In addition, about 1.5 MMBF of merchantable lodgepole pine were removed from several stands on the Ninemile District following pheromone baiting in 1984. Table 13 shows trees killed/acre for the past 3 years, and predicted infestation trend for 1985.

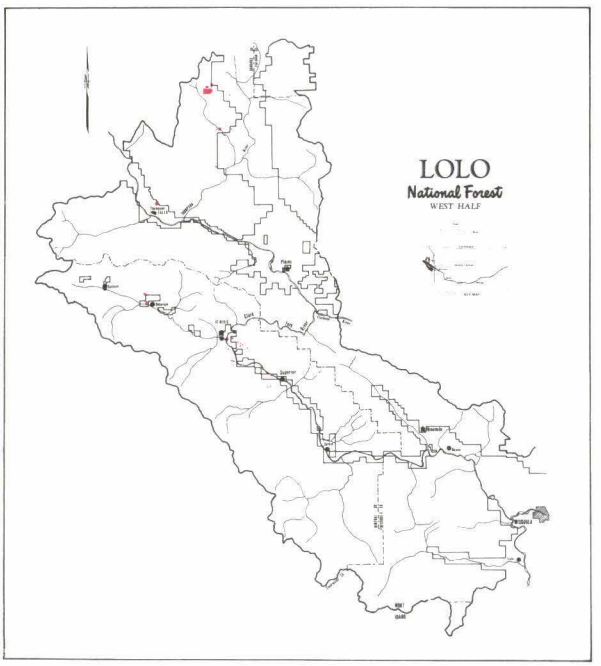
Table 12.--Acres infested by host type by Ranger District, Lolo National Forest and adjoining State and private lands, 1975-1984.

	RANGER DISTRICT																				
	Missoula		Ninemile				Plains			Superior			State & private				Total				Grand
Year	LPP	PP	LPP	WBP	WWP	PP	LPP	WBP	PP	LPP	WWP	PP	LPP	WBP	WWP	PP	LPP	WBP	WWP	PP	total
1975							2,405						2,600			100	5,005			100	5,105
1976							3,100						17,174			75	20,274			75	20,349
1977							3,475						7,124			60	10,599			60	10,659
1978							6,915		85				17,641			75	24,556			160	24,716
1979							5,535						3,174				8,709				8,709
1980							12,670						14,421				27,091				27,091
1981		250					9,430						6,765			60	16,195			310	16,505
1982		80	720				15,798				580		1,380				17,898		580	80	18,558
1983		24	1,154			5	32,559			340		30	5,148	4,161	250	5	39,201	4,161	250	64	43,676
1984	202	92	2,088	80	327	393	27,665	118	627	2,089	20	521	7,315	2,111	76	487	37,598	2,309	1,423	2,120	42,450

Table 13.--Trees killed/acre and trend prediction for Ranger Districts, Lolo National Forest.

Ranger District	Trees killed/acre				Predicted trend
	Older	1983	1984	Total	
Ninemile	8.7	11.4	9.7	29.8	Increasing
Plains	78.3	16.4	21.7	116.4	Increasing
Superior	41.6	12.9	43.3	97.8	Increasing

Infestations are predicted to expand and intensify in 1985 on all Districts.



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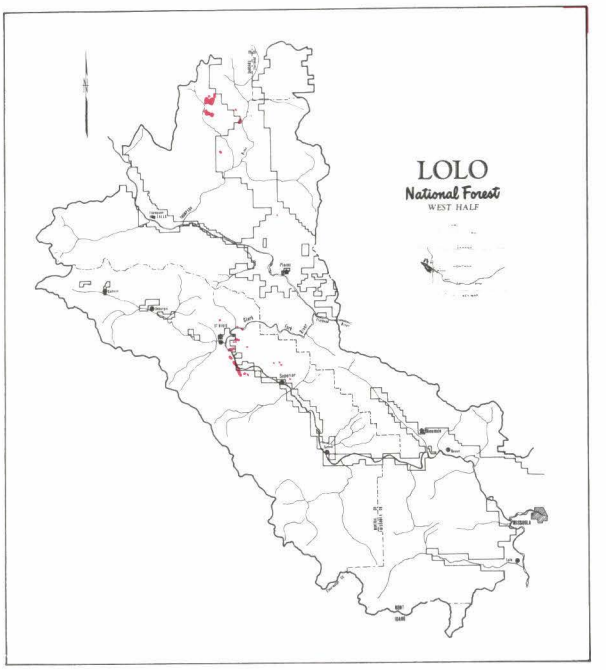

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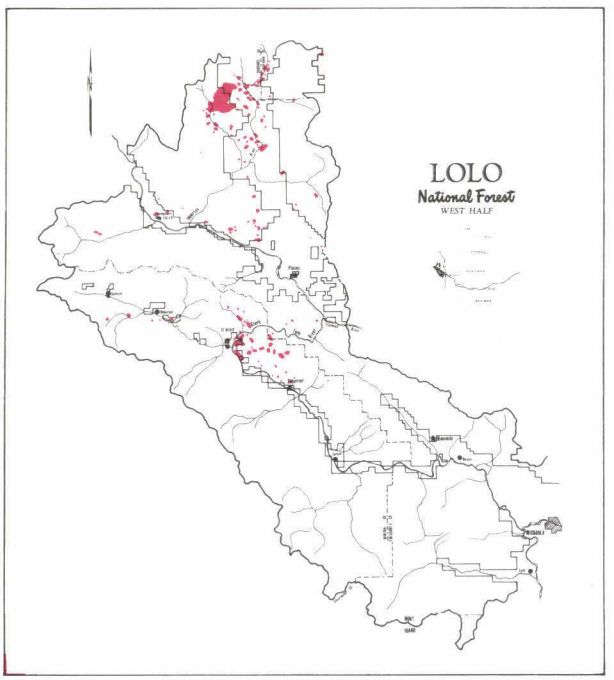

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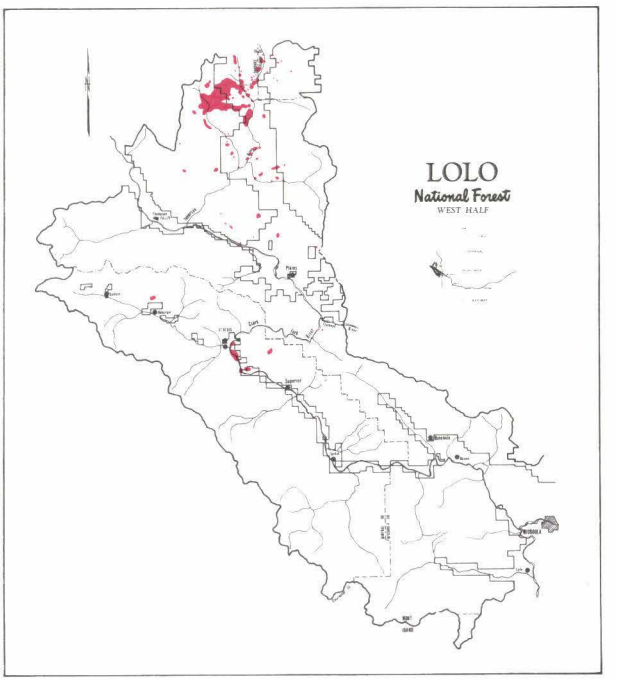
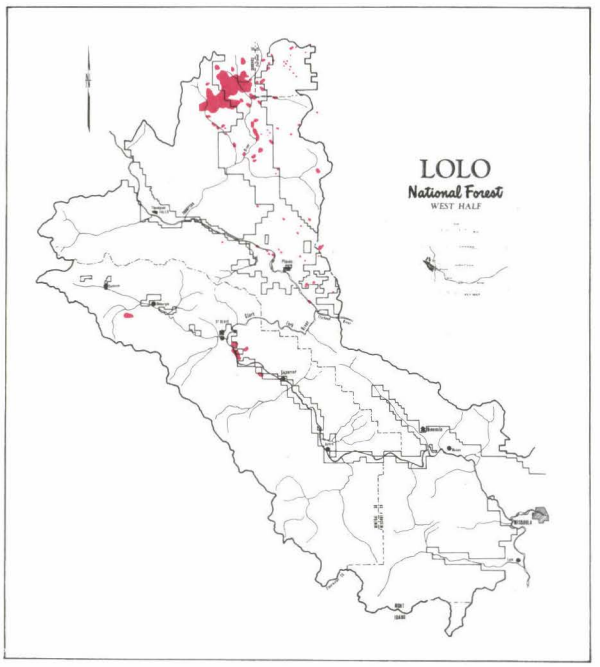


1976

Figure 10.--Chronology of mountain pine beetle infestation, Lodgepole pine type, Lolo National Forest, Montana, 1973-1984.



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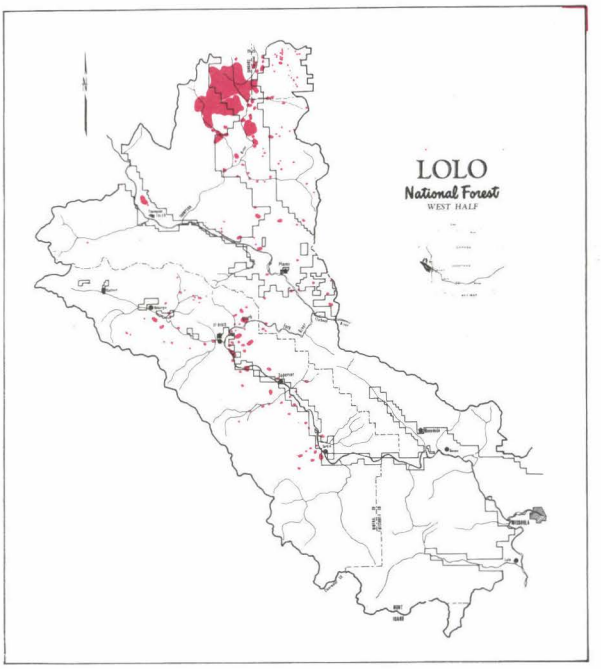

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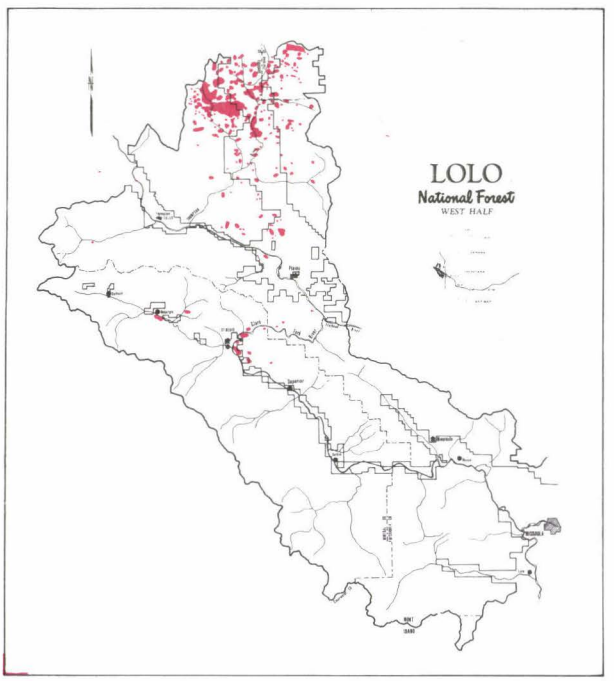

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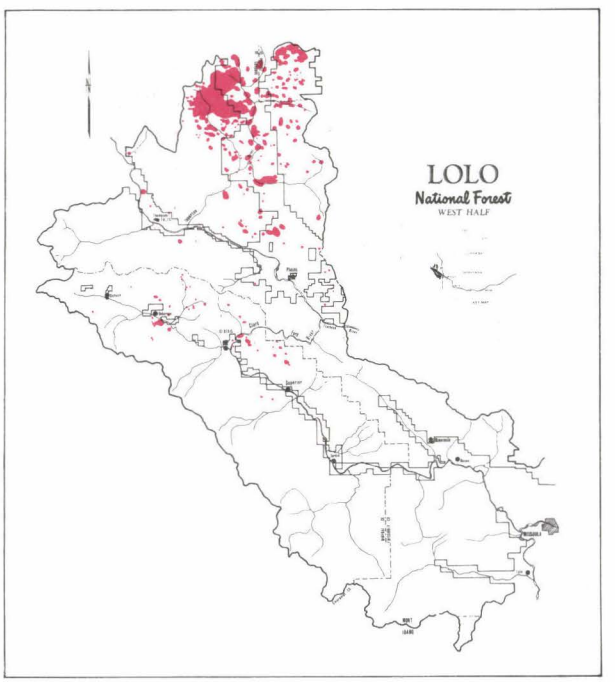
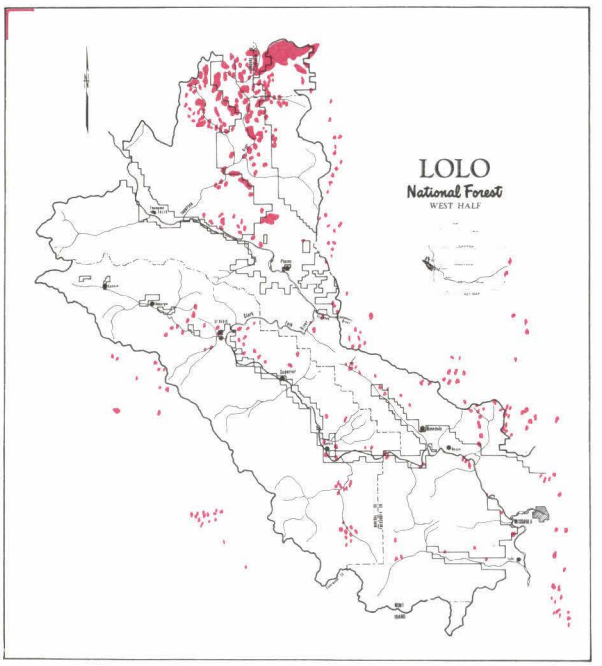


1980

Figure 10 cont.



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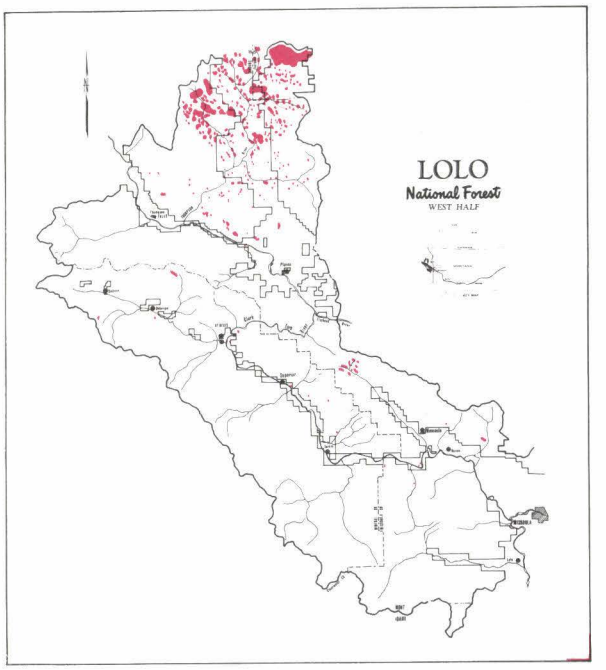

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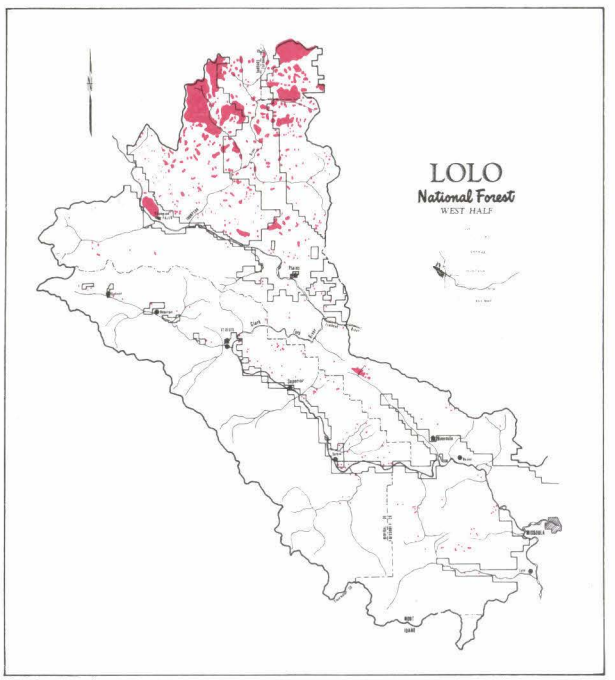

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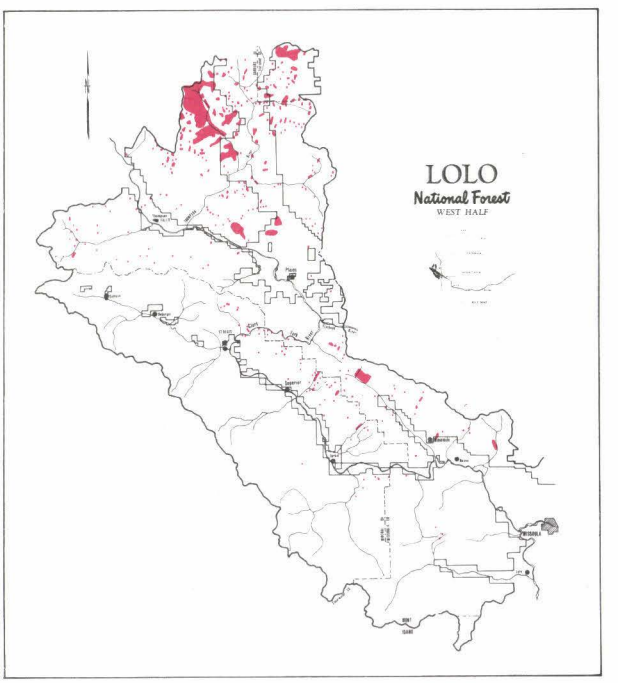


1984

Figure 10 cont.

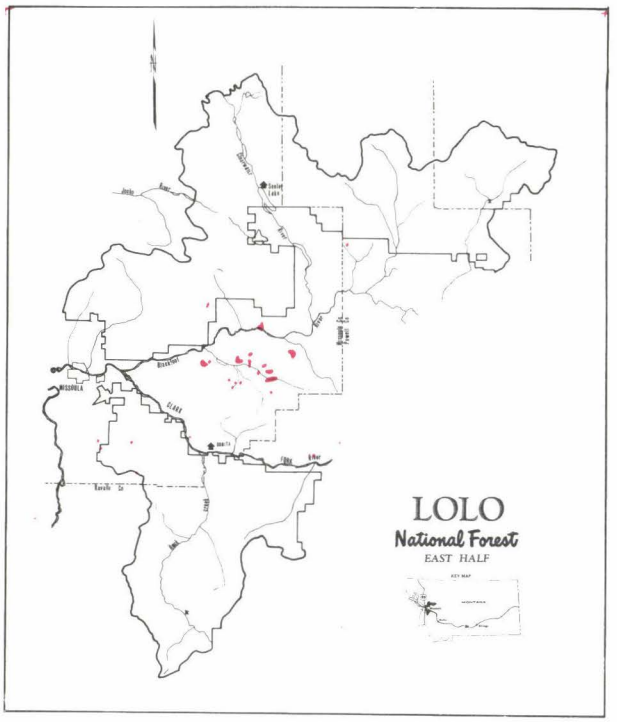


Figure 11.--Mountain pine beetle infestation, Ponderosa pine stands, Blackfoot River Drainage, Montana, 1984.

NEZPERCE NATIONAL FOREST

Beetle populations began developing in lodgepole pine stands on the Elk City and Red River RD's in 1979 (Table 14).

Table 14.--Acres of mountain pine beetle infestation**, by Ranger District, Nezperce National Forest, 1979-1984.

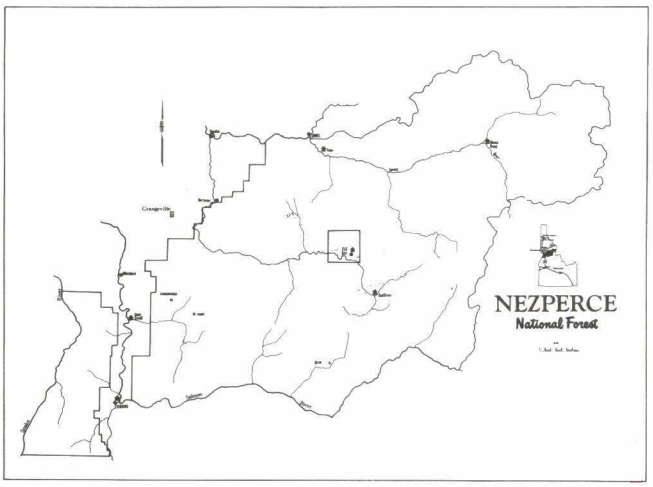
	RANGER DISTRICT						
Year	Clearwater RD	Elk City RD	Moose Cr. RD	Red River RD	State & private	Total acres	Trees killed
1979		250		50		300	720
1980		1,000		650		1,650	2,960
1981		2,000		900		2,900	19,600
1982		1,300		1,400		2,700	27,270
1983	506	389	2,078	2,669		5,642	182,236
1984	0	3,152	-	13,899	991	18,042	84,797

** Includes all host species.

More than 18,000 acres of lodgepole pine type were infested by 1984. Chronology of infestation is shown in Figure 12. Infestation expanded throughout Red River drainage and its tributaries, along with Crooked River, and Deadwood Creek. Newly developing infestation occurred in Jerry and Center Creeks.

In an effort to combat the increasing epidemic, an environmental analysis was prepared which evaluates the mountain pine beetle situation and provides management alternatives for the 82,000 acres of lodgepole pine type included in the analysis area. Sales are being implemented to salvage dead lodgepole pine, and pheromone baiting to contain existing beetle populations is being implemented with harvest of green stands. The majority of sales are being implemented in high-risk stands to reduce green volume prior to beetle attack. Between 1980 and 1985, 48.4 MMBF were removed from about 5,700 acres in an effort to reduce green volume prior to infestation. Of this, 1.4 MMBF were dead. Funnel trapping was employed in several infested stands in an effort to reduce current infestation status.

The epidemic is predicted to increase on both the Elk City and Red River RD's in 1985.



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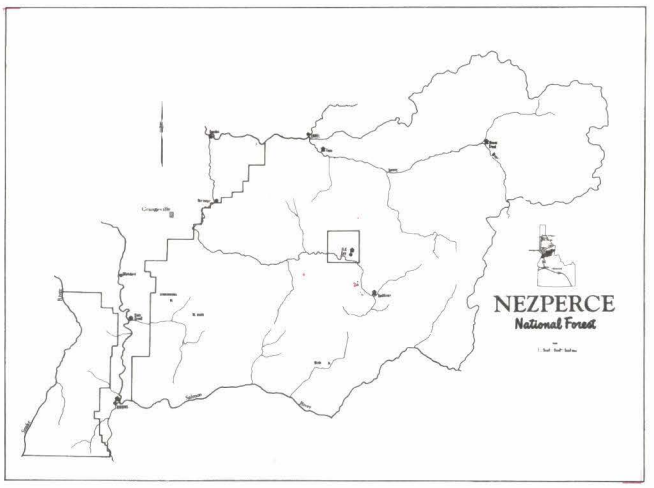

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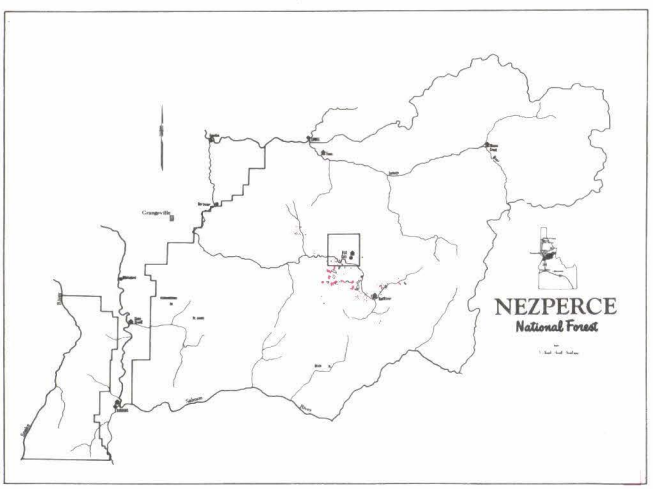

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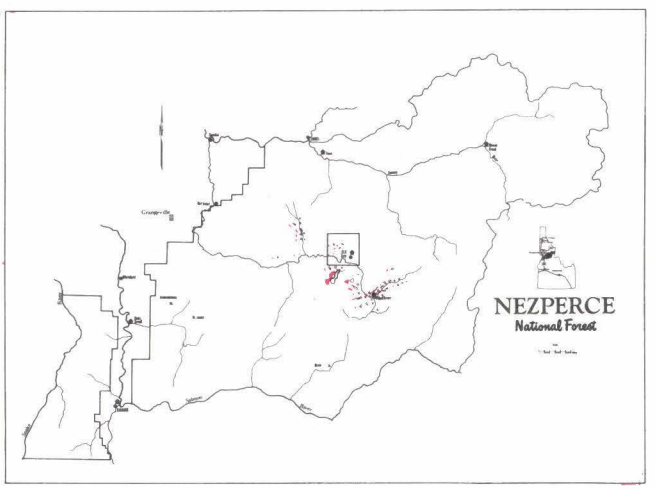
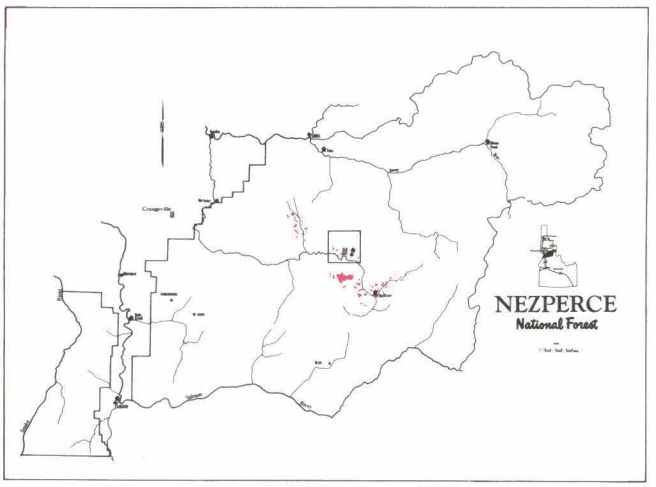


1980

Figure 12.--Chronology of mountain pine beetle infestation, Lodgepole pine type, Elk City and Red River Ranger Districts, Nezperce National Forest, Idaho, 1977-1984.



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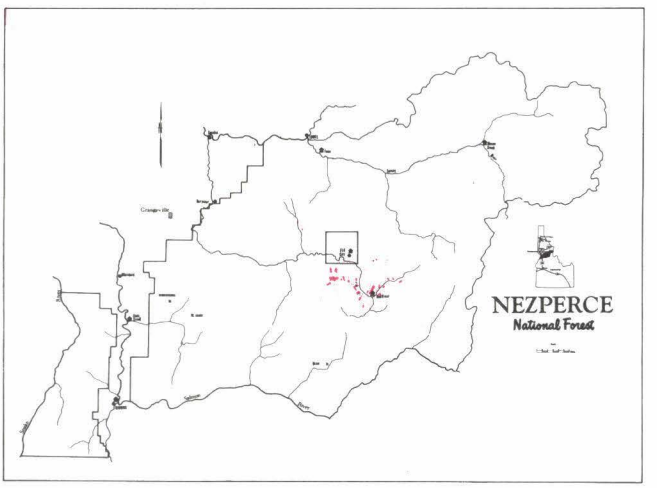

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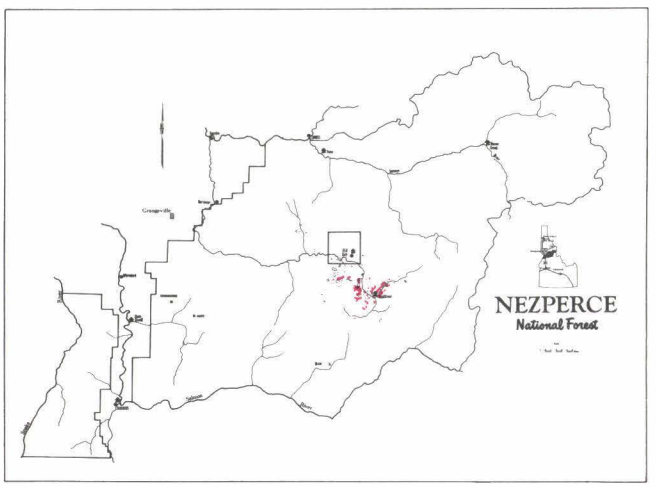

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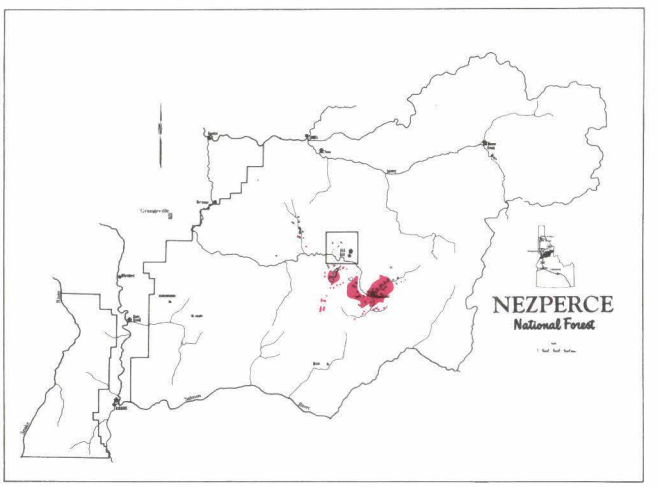


1984

Figure 12 cont.

GLACIER NATIONAL PARK

The massive outbreak which began in 1972 continued to decline through 1985 (Table 15). Chronology of infestation is shown in Figure 13. Infestation has declined to near endemic status on the west side of the Park, although small, infested groups containing 2- to 20-tree groups of western white pine and lodgepole pine are scattered in Ole, Park, Coal, Nyak, Hurricane, Belton Hills, Glacier and McDonald Creek drainages in the southern end of the Park. In addition, widely scattered single to 20-tree infested groups occur in many drainages along the west side of the Park.

In the northeastern portion of the Park, infestation was mapped on 17,625 acres of lodgepole pine type. Extensive tree mortality was observed throughout the Belly River drainage but this will decline in 1985 due to host depletion. Group kills of 2 to 1,000 trees occur from Eagle Creek north to Kennedy Creek drainage.

Hazard tree removal in campgrounds began in 1978. Thousands of trees have been removed from all campgrounds since then. Additional high-hazard trees have been removed along main roads.

The epidemic will continue to decline throughout the eastern and southern portions of the Park in 1985.

Table 15.--Acres infested by host type, Glacier National Park, 1972-1984.

	HOST				
Year	Lodgepole pine	Whitebark pine	Western white pine	Ponderosa pine	Total acres
1972	1,180				1,180
1973	3,600				3,600
1974	4,530				4,530
1975	13,354				13,354
1976	103,887				103,887
1977	142,871		7		142,878
1978	164,492		475		164,967
1979	206,115	8,912	855		215,882
1980	276,266	14,997	1,125		292,388
1981	189,350	740	1,300	500	191,890
1982	31,619	150	40	5	31,814
1983	23,191	83	200		23,474
1984	17,620	5			17,625

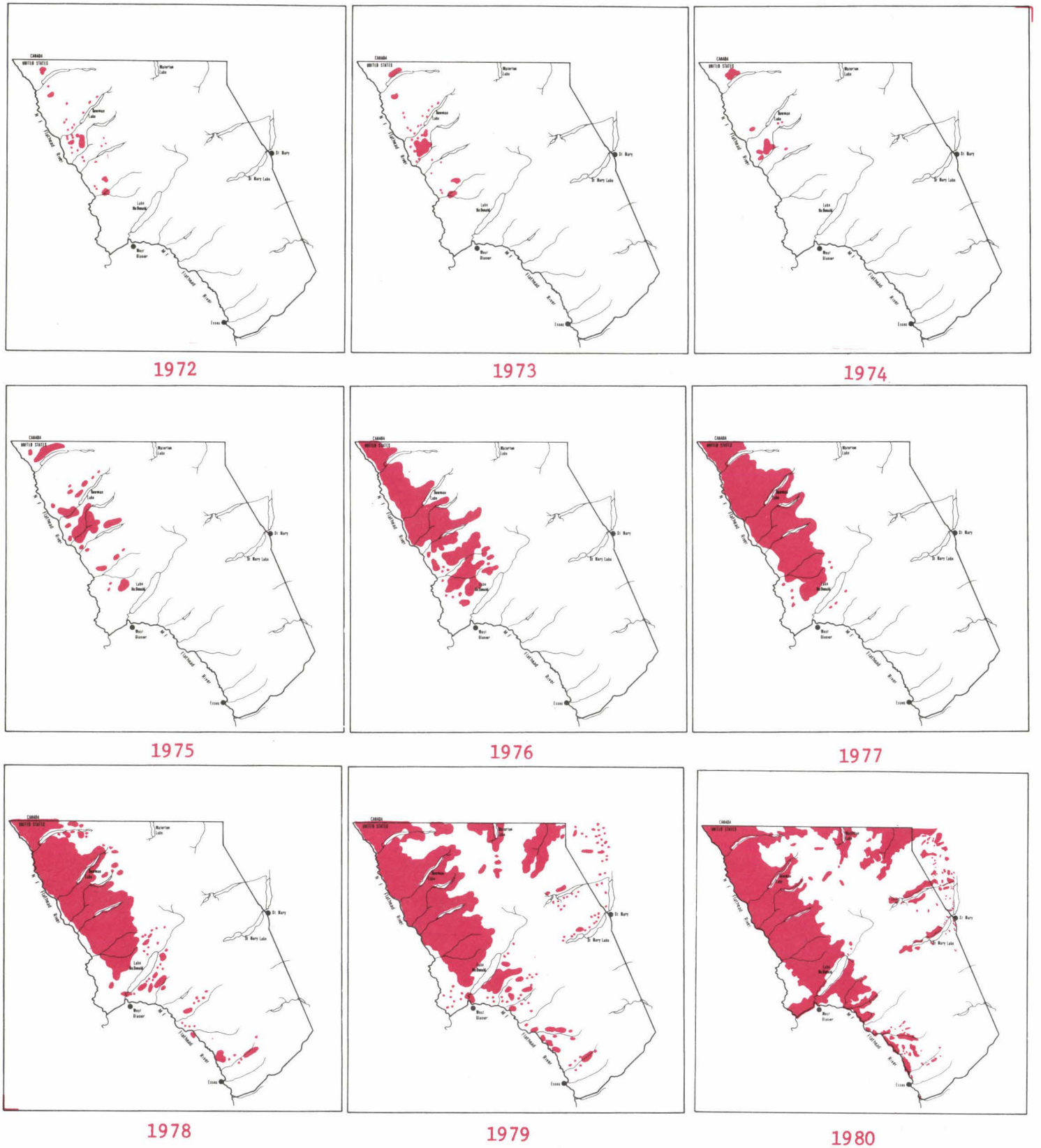
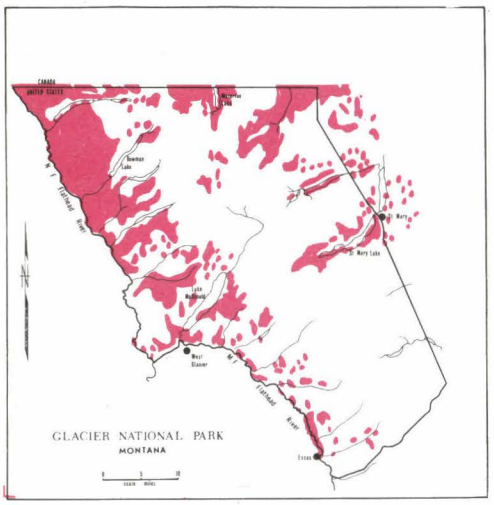


Figure 13.--Chronology of mountain pine beetle infestation, Glacier National Park, Montana, 1972-1984.



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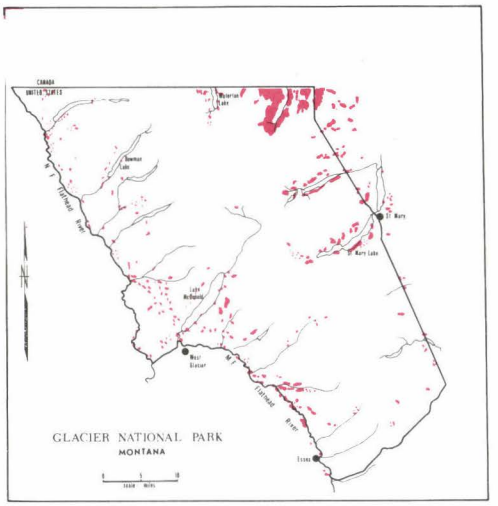

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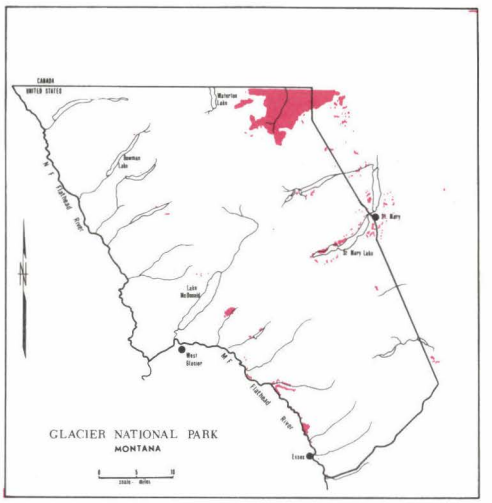

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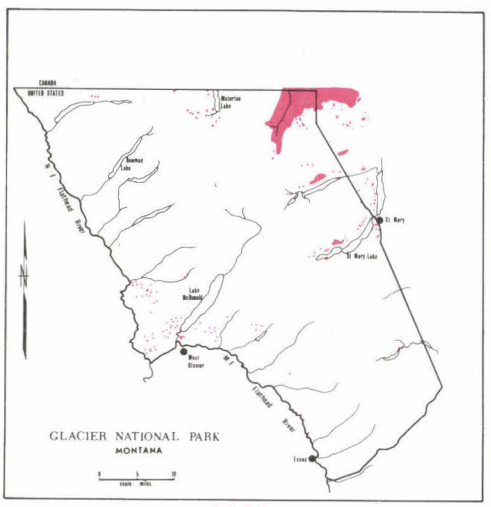


1984

Figure 13 cont.

YELLOWSTONE NATIONAL PARK

The epidemic which developed in the Bechler River drainage in 1965, spread north and east through three-quarters of the Park, and infested 964,878 acres by 1981. The infestation declined to 106,498 acres by 1984 (Table 16). Chronology of the outbreak is shown in Figure 14. More than 22 million lodgepole and whitebark pines were killed during this 19-year period.

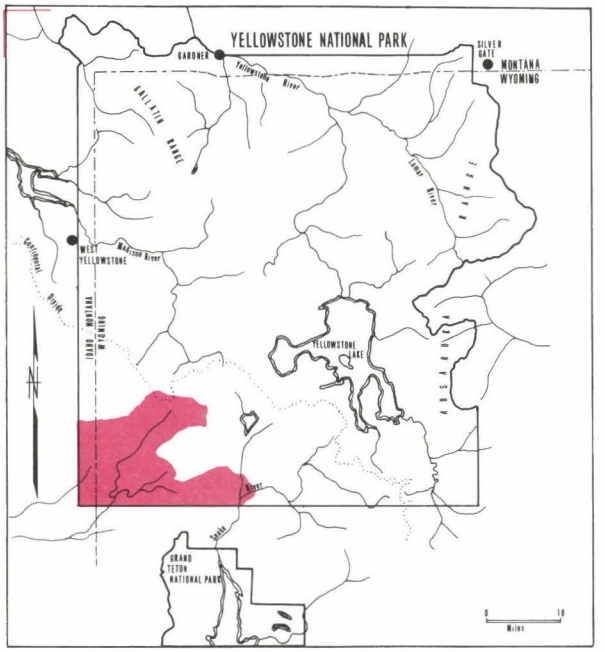
In 1984, the majority of faders occurred in the northern one-fifth of the Park from Lamar Valley west to the Park boundary. Singles or groups of 2 to 3 faders were observed widely scattered throughout older infested areas of the Park.

Table 16.--Acres of lodgepole-whitebark pine type infested and trees killed in Yellowstone National Park from 1969 to 1984.

Year	Acres infested	Trees killed
1969	100,000	100,000
1970	160,520	250,000
1971	511,200	700,000
1972	697,600	1,200,000
1973	772,300	1,200,000
1974	847,960	1,600,000
1975	692,228	692,288
1976	614,206	1,000,000
1977	129,300	1,844,160
1978	171,244	1,371,684
1979	431,114	2,815,359
1980	821,300	2,335,250
1981	964,878	2,555,498
1982	957,728	1,430,045
1983	723,731	835,050
1984	106,498	55,888

In an effort to protect high-value trees, 220 lodgepole and whitebark pines were treated as a field test with pine oil (Norpine-65P) in Mammoth Campground and at Park headquarters in 1983, and 300 trees were treated in these areas and at Old Faithful Inn on a test basis in 1984. In addition, 50 Lindgren baited funnel traps were deployed around Old Faithful resort to trap residual beetle populations and prevent additional tree mortality in 1984. The epidemic should continue to decline in 1985.

Because mortality was so extensive, it was necessary to clearcut some campgrounds and remove all high-hazard trees from others. Also hazard trees were removed from along travel routes in order to protect campers.



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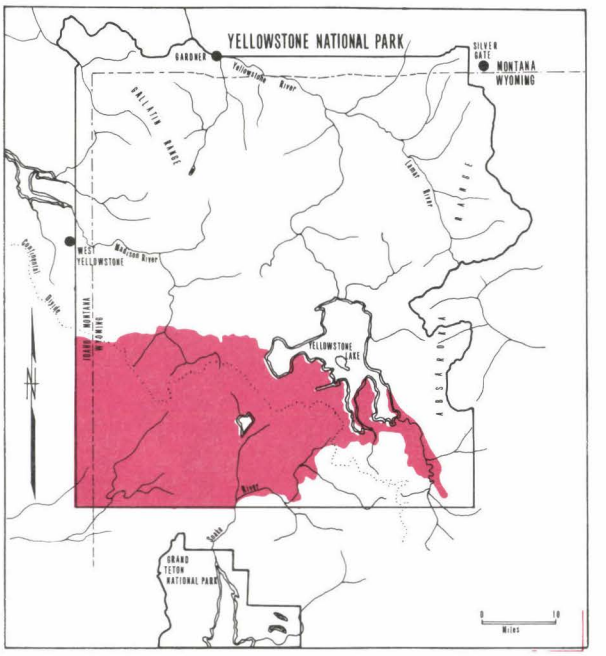

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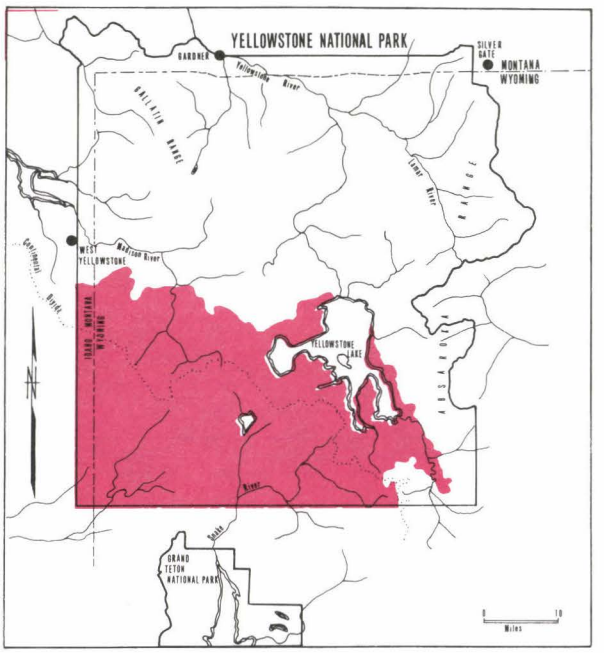

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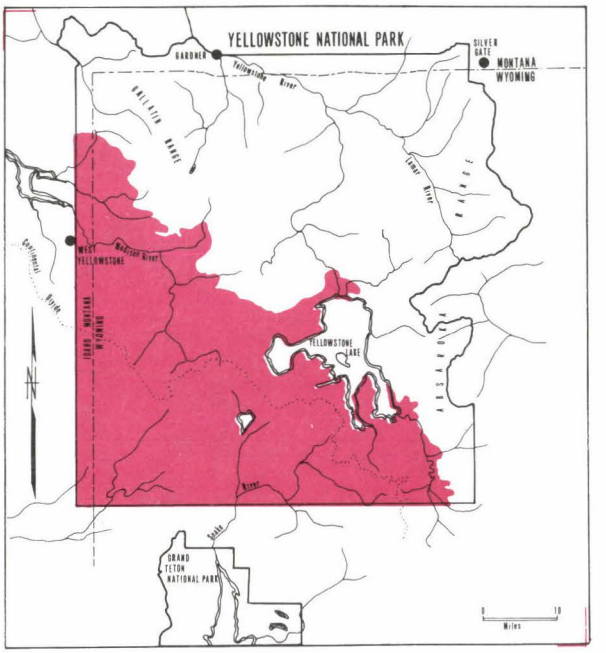
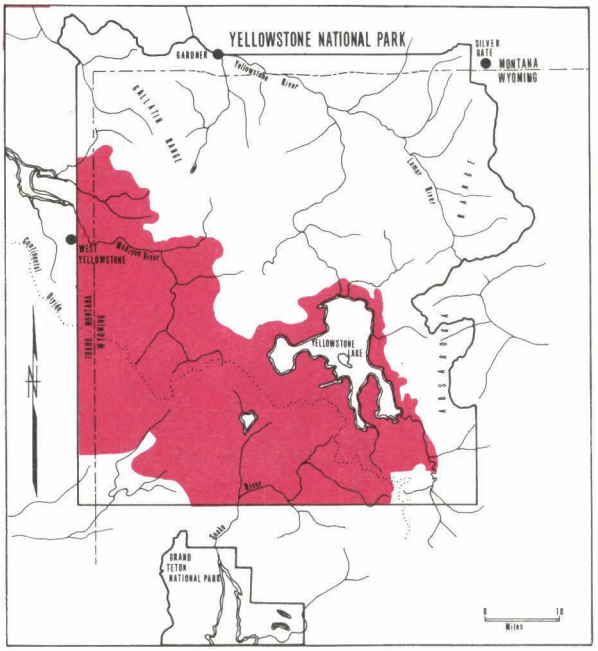


1973

Figure 14.--Chronology of mountain pine beetle infestation, Yellowstone National Park, Wyoming, 1970-1984.



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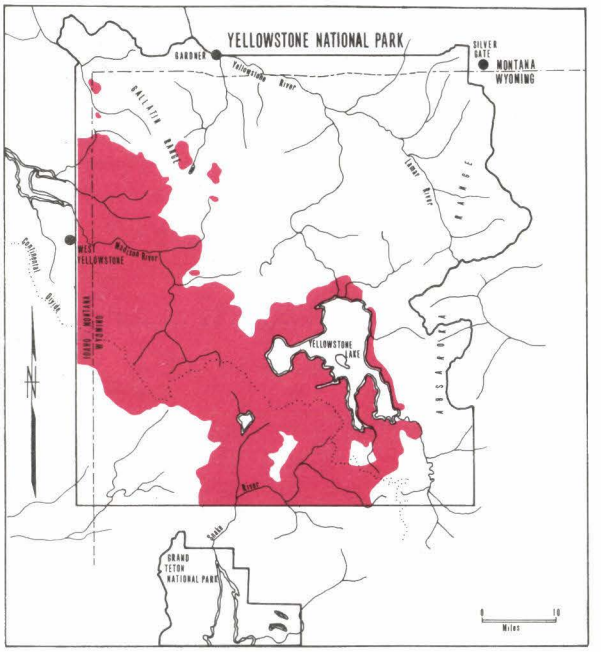

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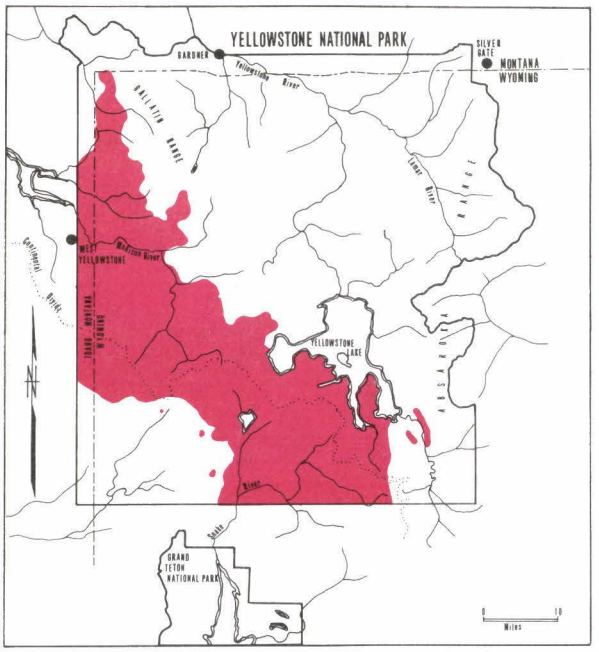

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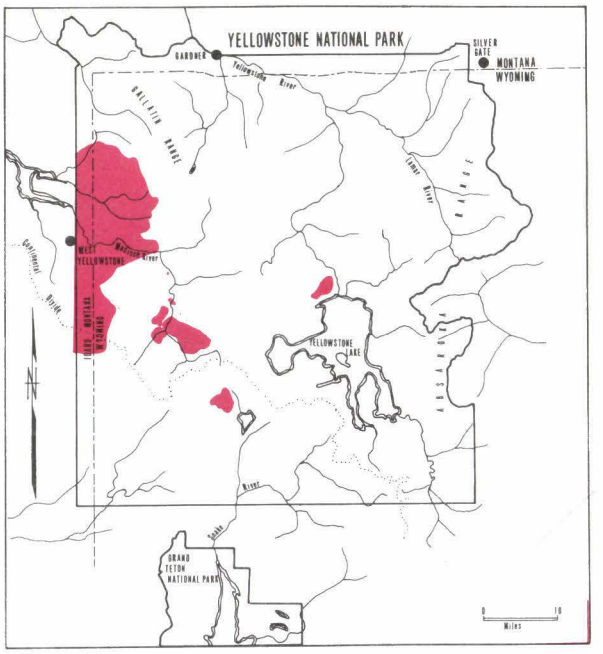
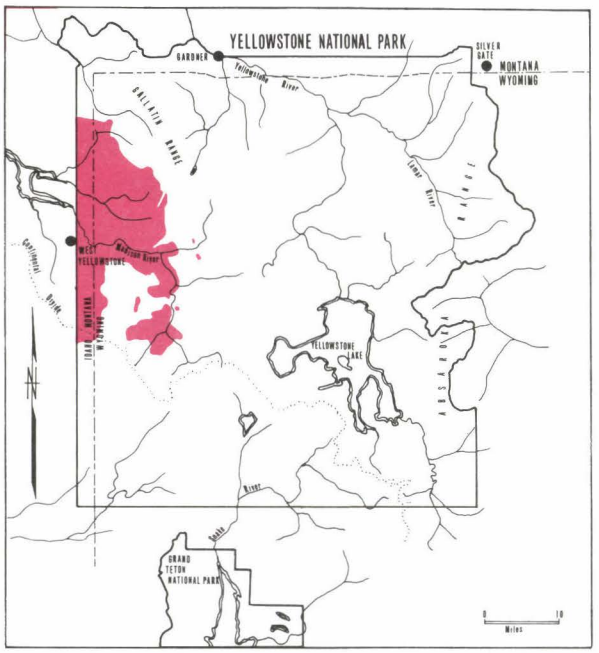


1977

Figure 14 cont.



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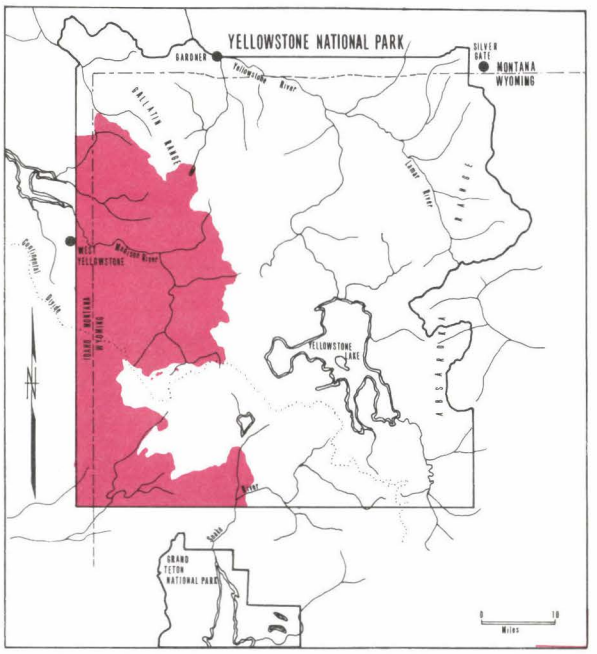

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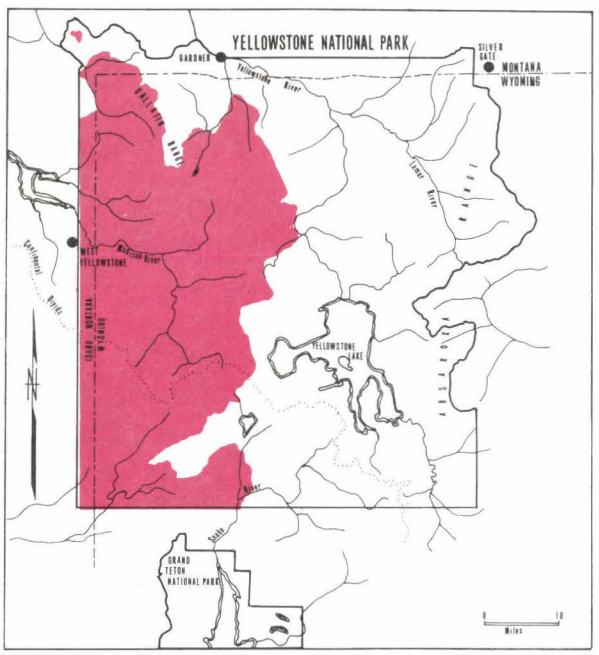

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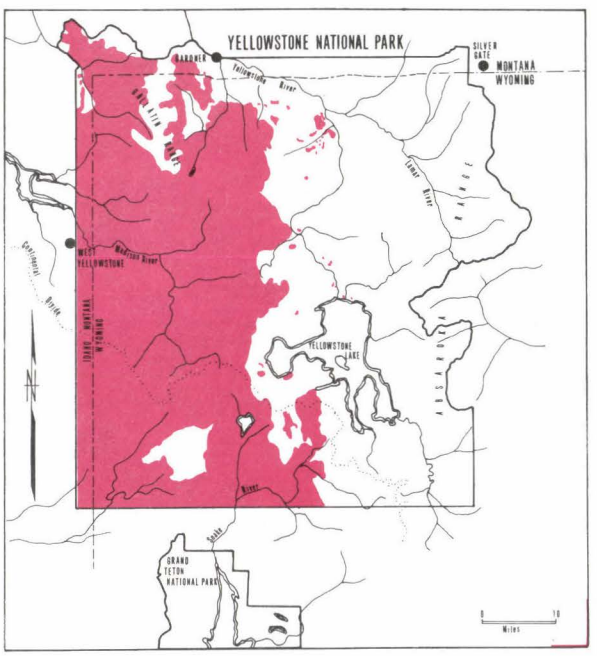

1981

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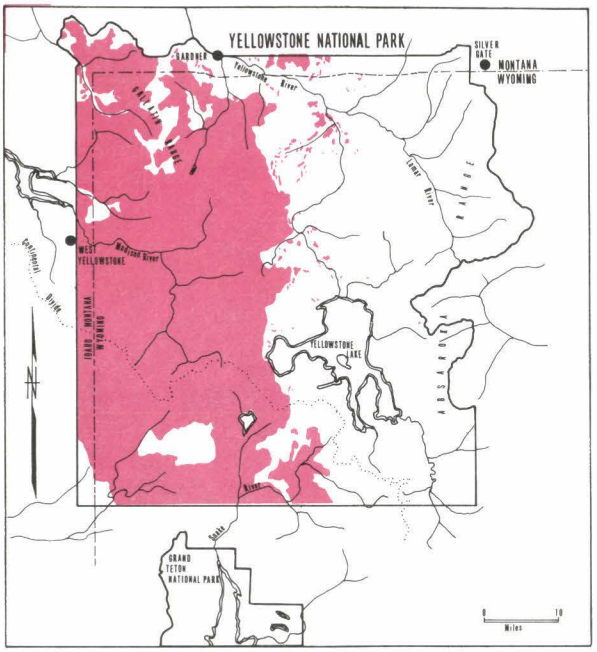

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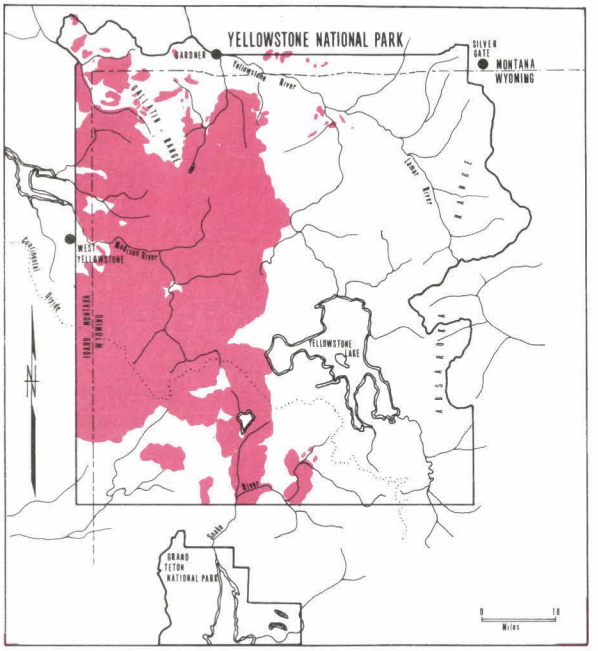

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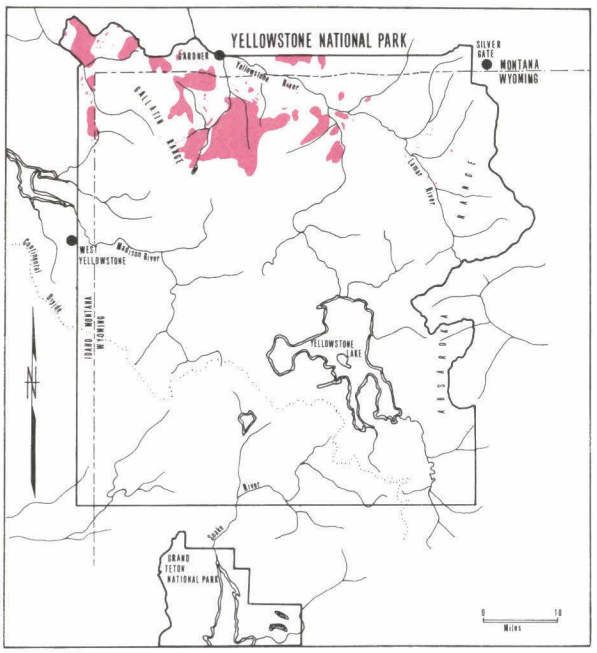

1984

Figure 14 cont.

BLACKFEET INDIAN RESERVATION

Infestation in lodgepole pine stands increased steadily since 1980. More than 8,700 acres of host type were infested in 1984, compared to 5,400 acres in 1983. More than 294 trees have been killed per acre in stands infested since 1980. Evaluation in Park, Lee, and Crusher Creek drainages show infestation increased from 17 to 19 trees per acre from 1983 to 1984. Tree mortality and acres infested will remain static or possibly decline in 1985.

CROW/NORTHERN CHEYENNE INDIAN RESERVATION

Beetle populations began developing in high-hazard, second-growth ponderosa pine stands on the Crow Indian Reservation in 1973. More than 500 scattered faders were first observed in Corral and Little Corral drainages in 1973. Infestation continued to increase until more than 13,266 faders were mapped on 4,300 acres in 1983, then declined to 3,370 faders on 1,247 acres in Little Thompson Creek south to Ash Creek by 1984. Infestation in pine stands on the Northern Cheyenne Indian Reservation was detected in 1980, and increased to 1,400 faders on 3,300 acres from Coal Creek east to Lame Deer, Montana, to Dry Creek south to Busby, Montana, by 1984. Evaluations in six separate areas show infestation will spread and possibly intensify in 1985.

FLATHEAD INDIAN RESERVATION

Infestation continued to intensify in the northwestern portion of the Reservation in 1984 (Figure 15). About 915 acres of lodgepole pine type and 1,223 acres of ponderosa pine type sustained epidemic infestation. Mortality of old-growth ponderosa pine is prevalent directly west of Hog Heaven. Several hundred trees were killed in mixed lodgepole/ponderosa pine type between Mill Pocket Creek and Teepee Mountain. The infestation will expand and intensify in 1985.

FORT BELKNAP INDIAN RESERVATION

Several hundred lodgepole/ponderosa pines were killed on about 1,300 acres in the Bear and Beaver Mountains near Zortman, Montana, during 1984 (Figure 16). Single tree and small group kills occurred throughout the southern and western half of the Reservation from Peoples Creek south to Laddle Butte. Evaluations within the Reservation and adjacent Bureau of Land Management lands show a decline in number of trees killed per acre from 1983 to 1984. Infestation is predicted to remain static in 1985.

A-

B-

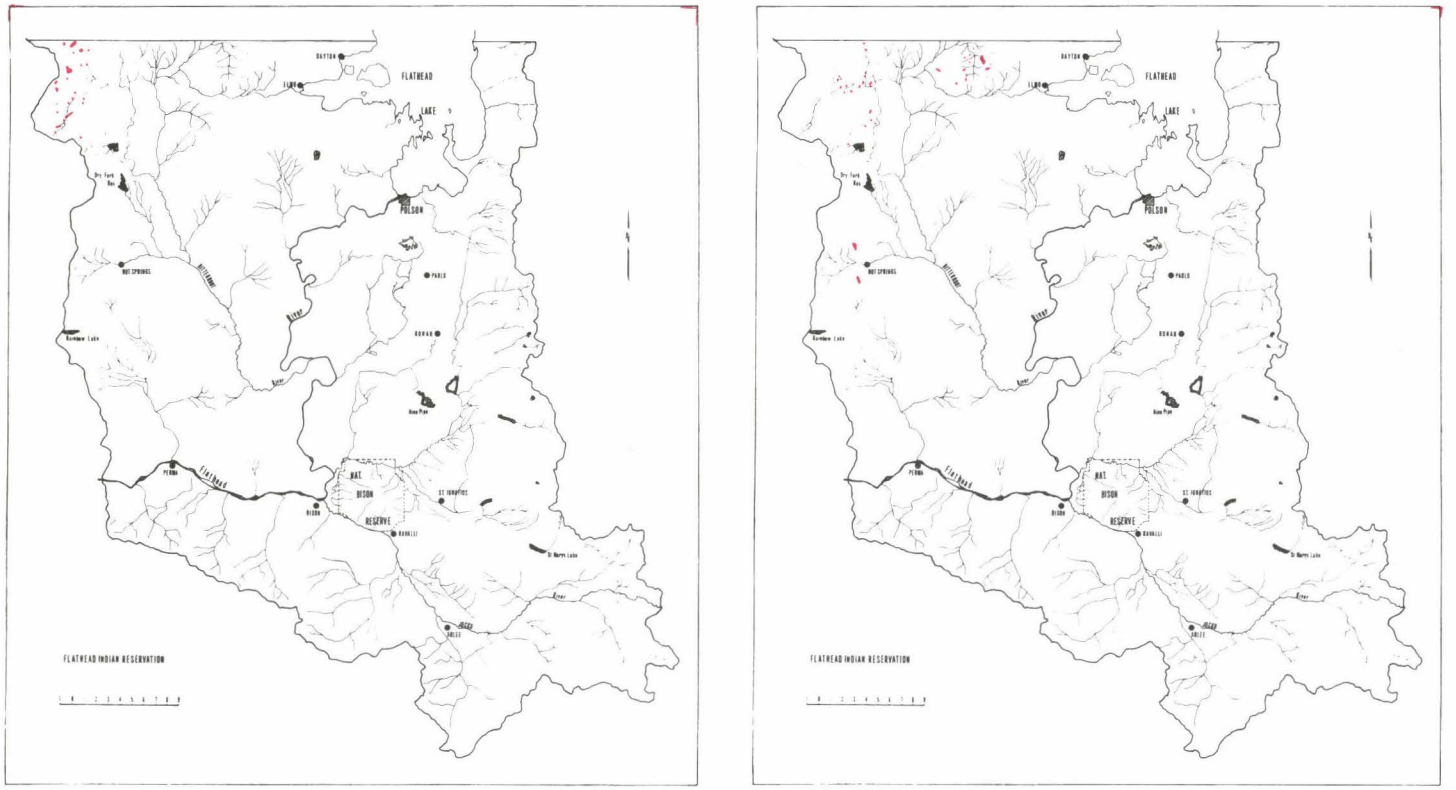

Figure 15.--Mountain pine beetle infestation, Flathead Indian Reservation, Montana, 1984, A-Lodgepole pine, B-Ponderosa pine.

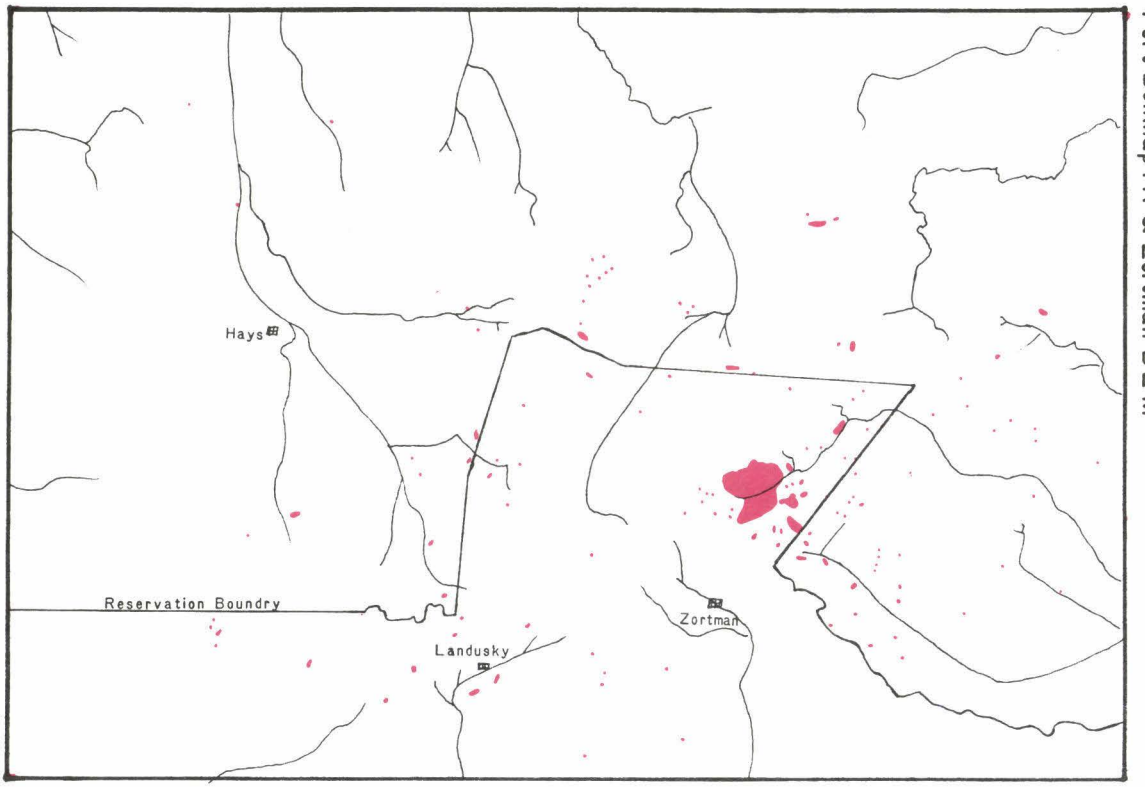

Figure 16.--Mountain pine beetle infestation, Ft. Belknap Indian Reservation, Montana, 1984.

ROCKY BOY'S INDIAN RESERVATION

Mortality of ponderosa pine occurred as mostly scattered singles, but one area (in Sandy, Eagle, and Beaver Creek drainages) had 500 trees killed in 1984 (Figure 17). Faders are widely scattered and appear indicative of a building beetle population.

Although evaluations revealed no newly attacked trees in 1984, the infestation is predicted to remain static or increase slightly in 1985.

Since 1979, more than 2.4 MMBF have been removed in an effort to salvage dead trees and remove green trees prior to beetle attack from all lands managed by the Bureau of Indian Affairs (Table 17).

Table 17.--Merchantable volume logged from all Reservations, 1979-1984.

	VOLUME MMBF					
Reservation	1979	1980	1981	1982	1983	1984
Blackfeet	3.9	5.7	.300	8.0	3.7	2.0
Crow	.437	1.9	.185	.690	.44	1.0
Flathead	29.7	20.3	2.9	18.6	.116	.900
Ft. Belknap	.311	.129	.35	.25	.25	.99
Fort Peck	.650	0	22.6	.60	.650	.650
Cheyenne	7.2	9.2	.338	1.1	1.1	11.7
Rocky Boy's	.323	.500	.174	.400	.570	.500

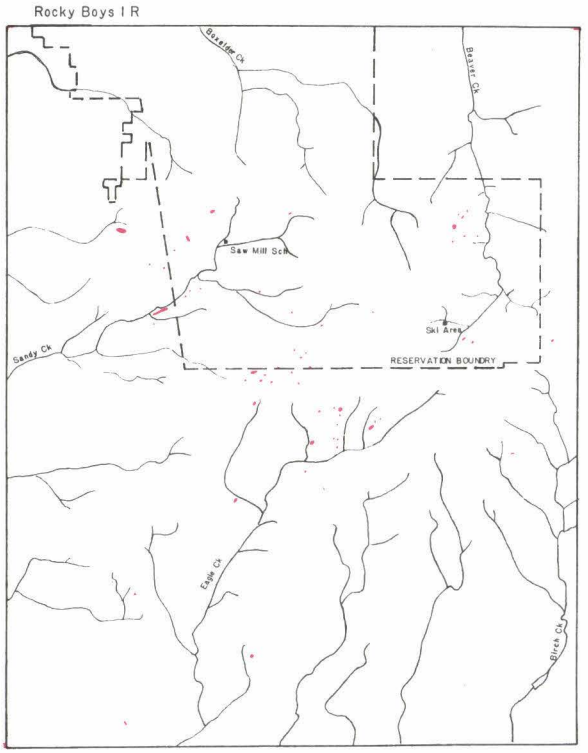

Figure 17.--Mountain pine beetle infestation, Rocky Boys Indian Reservation, Montana, 1984.

STILLWATER STATE FOREST

Infestations declined in lodgepole pine type from 7,491 acres in 1983 to 1,336 acres in 1984. Beetle activity persisted on the west side of the Whitefish Mountain Range in lower Swift Creek and Fitzsimmons drainages. Tree mortality and acreage infested are predicted to increase in 1985.

SWAN RIVER STATE FOREST

More than 2,700 acres of lodgepole pine type and 461 acres of ponderosa pine type sustained epidemic infestation in 1984, compared to only 30 acres of western white pine in 1983. Infestation will probably increase in all host types in 1985.

THOMPSON RIVER STATE FOREST

Tree mortality in lodgepole pine type declined from 15,096 acres in 1983 to 11,524 in 1984. Mortality of old-growth ponderosa pine occurred where stands were interspersed or adjacent to epidemics in lodgepole pine. Increased tree mortality is predicted in 1985.

CRAIG MOUNTAINS - BUREAU OF LAND MANAGEMENT - IDAHO

Infestation in lodgepole pine stands increased from 4,000 acres in 1983, to 6,257 acres in 1984. More than 460 acres of adjacent ponderosa pine stands sustained increased tree mortality. Extensive salvage logging of dead trees and sanitation-salvage of green stands have done much to capture merchantable volume. However, the infestation is predicted to intensify in 1985.